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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The National Ironfounding Employers' Federation
The Welsh Engineers' and Founders' Association
and
The Foundry Trades' Equipment and Supplies Association

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The Foundry Exhibition

Now that we have had an opportunity of examining in some detail the Foundry Trades' Exhibition at Olympia we feel that we must congratulate the exhibitors on the excellence of their stands. Full use has been made of the art of showmanship. Everybody must appreciate that such materials as pig-iron, coke, bricks and sand are not easy to exhibit effectively, but by the use of castings, cores, imitation cupolas, and lighting, stands have been designed and furnished which rival in attraction any of those in the engineering section.

The opening ceremony was performed by Lord Sempill, who referred to the Foundry Exhibition in the following terms:—

There was always a representative display of metallurgical products, and the progress of that branch of the industry should be mentioned, particularly as there was a special display at the exhibition of foundry equipment. A study of this section would indicate the considerable advances made in recent years, especially in the craft of iron and steel founding. After suffering neglect for a century, cast iron, under the stimulation of the Institute of British Foundrymen and the British Cast Iron Research Association, had been receiving the attention which its qualities merited, and with the knowledge now available further progress was assured. In other ferrous and non-ferrous materials research continued, and though it might not have led to any sensational development in the past two years it was heading towards a degree of knowledge of alloys on a fundamentally scientific basis which held incalculable possibilities.

Mr. H. Winterton, Vice-President of the Institute of British Foundrymen, was accorded the privilege of thanking Lord Sempill for his address. Mr. G. T. Lunt, the President of the Foundry Trades Equipment and Supplies Association, who replied to the toast of "Success to the Exhibition," proposed by Sir Francis Goodenough at the inaugural luncheon, made a plea for the more active participation of the actual foundries in future exhibitions. Actually there must be about fifty foundry concerns already showing, but not necessarily as founders. There are exhibits of light alloy, die, iron and steel castings as such, but various founders have also to show at the Royal Show, the British Industries Fair, the Motor Show, the Building Trades', the Transport, the Brewers', the Bakers', the Laundry, the Printers' and numerous other exhibitions, depending on their line of manufacture and the appeal they make. We suggest that the founders catering for the general engineers and shipbuilders certainly should give future foundry exhibitions a maximum of support.

The exhibition has been particularly well attended and good business has been recorded. There is a good deal of comment that only two moulding-machine concerns are showing, and we can only hope that it is extreme pressure of business that has prevented a more representative exhibition. That there will be an intensive demand for moulding machines in the near future is evident. We have just replied to a demand from the South African engineering employers for moulders that a real shortage exists in this country.

The banquet given by the organisers of the Exhibition (Messrs. F. W. Bridges & Sons) to the overseas guests was a particularly pleasant function. Mr. R. H. Brackenbury was one of the principal speakers, and his gift of oratory has been heard far too seldom in foundry circles. Mr. Charles Monseur, of Liége, replied for the overseas guests, and extended a very cordial invitation to the foundry industry to participate in the Brussels International Conference.

Recent Planning Schemes.—I
The Distressed Areas

We propose to examine briefly some recent schemes which have been put forward for improving the economic position of the country. There is a feeling in many quarters that one of the advantages of countries enjoying a dictatorship is that big decisions can be taken quickly, whereas the democratic method followed in this country is inevitably slower, even if the ultimate action taken is a compromise more satisfactory to the various interests concerned than the more spectacular and drastic decisions of a dictatorship. The main reason why something must be done lies in the existence of two million unemployed. Unemployment is very demoralising, and it exists side by side with a certain shortage in some skilled occupations. For the sake of the men concerned, and for the sake of the country, the unemployment problem must not be left to drift into the region of the insoluble. It will, therefore, first of all be useful to consider the report on the distressed areas

made by the Special Commissioners appointed by the Government. Mr. Stewart, who reported on the north-eastern areas, is an industrialist with experience in building up a highly successful business. The distressed areas, notably the North-East Coast and South Wales, are very important from the foundry point of view. With regard to coal, Mr. Stewart looks to inventive genius to treat coal for its valuable products. He favours the State ownership of mining royalties and the reconsideration of the quota scheme for coal. He recognises that the well-being of the special areas is very dependent on general national prosperity, and advocates the reorganisation of the iron and steel industry. He is apparently in favour of transferring unemployed from the distressed areas to places where new factories are opening.

Two other schemes advocated have been referred to recently in these columns, and it is particularly striking to find them advocated from the special point of view he has to take. The first is that boys and girls under sixteen should be prevented from entering industry, and should be trained practically and physically. This is virtually a recommendation to increase the school-leaving age, urged entirely from a non-educational point of view. Nevertheless, it reinforces the arguments of those who believe in raising the school age for purely educational reasons. The second proposal is to provide pensions at 65, with the object of removing from the sphere of industry the 700,000 people now at work over that age. He advocates holidays with pay for workmen to the extent of one week for all those continuously employed in the same job for one year, and also suggests that the Government should assist firms to apply shorter working hours without reducing wages or the standard of living. He is not particularly in favour of expenditure on public works as a means of reducing unemployment, but would assist those which can be shown to have value in permitting the economic development or social improvement of the areas concerned. He would negotiate with the Dominions for the resumption of Empire migration, and suggests the placing of Government contracts in the special areas. He would attempt to re-establish apprenticeship.

The Commissioner for special areas in Scotland, Mr. Rose, speaks of the limited extent to which he can be of assistance, but thinks there may be room for an authoritative Scottish body having power to explore industrial conditions and to introduce into the economic structure that orderly and planned development which has hitherto been lacking. The Commissioners in general are, of course, fully aware that nothing can compel people to set up works in the special areas or anywhere else, and to that extent the power that they have to deal with the problem is limited.

It should be clearly understood that we do not necessarily endorse the views of the various commissioners, as they have given insufficient attention to the "time factor."

Catalogue Received

Alloy Steel Castings. Three heat - resisting steels—"Shadrach," "Meshach" and "Abednego"—are described in a new publication issued by Messrs. Head, Wrightson & Company, Limited, of Thornaby-on-Tees. The choice of these names is particularly clever, as on account of the extraordinarily euphonious note they strike they are easily remembered by everybody. The booklet, which runs to ten pages, is well written and excellently illustrated, but we think the three brands should have been more clearly separated, for, as it is, all three names are inextricably mixed, and just as their Biblical forerunners exist in the lay mind as a triple entity, we are afraid that the make-up of the booklet leaves an analogous mental impression.

Around the Exhibition

It will be seen from the selection of pictures of the stands included in the Foundry Exhibition, reproduced elsewhere, that never before have so many striking designs been used. The stand of the Ford Motor Company, which exhibits a number of castings made from their own brands of machine-cast pig-iron, certainly strikes a new note in stand design. The general lay-out consists of an impression of a blast furnace with the tapping of the metal done in realistic colour effect. A series of dioramas shows pictorially the various processes from the tapping of the molten iron from the blast-furnace to the teeming of the moulds. These are very artistically carried out, and certainly form a striking background to the stand. This stand, in common with several others, carries an exhibit of cast-iron crankshafts.

Another stand which presents a striking appearance is that of Imperial Chemical Industries. The central portion of the stand is occupied by a cupola of gargantuan dimensions, the interior of which is furnished as an office. The metal from the cupola is formed by a length of Neon tube and empties itself into a ladle, which is also illuminated, and is a very brilliant imitation of liquid metal covered by slag. At the side of the ladle is a life-size figure emptying in a quantity of soda ash.

The stand of British Pigirons is also of a striking character, and its most novel feature has been appropriately styled "inside information." Located at a convenient height for examination is a 3-ft. length of "Midhill" All-mine special pig-iron, which has been bored out and finished to a diameter of ¾ in. from end to end. The bore is definitely perfect, and an assurance is given that this was the first piece of pig-iron selected from a consignment despatched only last month to one of the main-line railway companies.

A really novel type of exhibit is being shown by Tilghman's and the Constructional Engineering Company. Both these firms show plants designed for cleaning castings by utilising centrifugal force applied to a stream of chilled-iron grit; the stream, of course, impinges upon the castings to be cleaned, and so eliminates the use of compressed air.

An excellent method of showing chilled-iron grit has been adopted by Bradley & Foster. A large-size mirror has been furnished with a series of magnets at the back, and the various grades of grit are shown attached to the mirror at regular intervals.

A stand which apparently is always busy is that of William Cummings & Company, because at regular intervals they are giving demonstrations of melting cast iron in their portable crucible furnace.

On the crown of the stand of the Morgan Crucible Company is a sign which shows metal leaving a crucible, and in this case also a Neon light is used for colouring the liquid metal.

Messrs. T. W. Ward & Company are to be congratulated on the efforts they have made to reproduce a real live working foundry. At the back is the usual cupola, whilst the floor is covered with black sand and everything is arranged for the afternoon's pour.

Two other stands which have certainly made great strides in the art of exhibiting foundry material are those of the Carborundum Company and General Refractories, Limited. In both cases the materials shown are so arranged that the space available has been used to the very best advantage.

Modernity and dignity have been combined in the stand of August's, Limited. Surmounting two hugh black pillars is a panel along which is running, continuously, an advertising message. Unlike most stands, there is a minimum of space

(*Concluded in next column.*)

Random Shots

"Marksman" in making a preliminary tour of the Foundry Exhibition on the day before the opening, found to his amazement that, writ large upon the window of THE FOUNDRY TRADE JOURNAL Stand, were the ominous words "To Let." By a method of elimination of the obvious innocents "Marksman" was quickly able to Bell the Cat and his pedigree pigs!

* * *

A very famous big-wig being personally conducted round the stands by "Marksman," after seeing Mr. Taverner's three-foot length of pig-iron bored right through the centre without showing a blemish, Stewarts and Lloyds' famous pig-iron springs, and all the other marvellous pig-iron exhibits, rather wisely exclaimed: "Why couldn't this be teamed straight into castings instead of wasting time and money making pigs. They used to!" If Miss Nellie Snookers at the Gayway Foundry hears of this, further developments can be confidently expected.

* * *

Engineers are obviously a little bewildered at the foundry show, as on so many stands cast-iron crankshafts loom large; cast iron giving longer life than manganese steel; foundry equipment with a better-than-machine-tool finish; blastless sand blasts; 26 tons per sq. in., with splodges of austenite, sorbite, pearlite, troostite, martensite. Cinderella has lost caste, and Aladdin's cave is the more popular story.

* * *

Exhibition Gossip

(1) One foundry spent £150,000 in plant and improvements last year, and will exceed that figure next year.

(2) A fire broke out on the stand melting cast iron, and it was put out by Monica.

(3) Fluffy bits of iron attached to a mirror are samples of chilled iron shot, and not aggregates of smuts from the washing.

(4) Neon lights are excellent for simulating molten metal.

(5) The best whiskey is to be had on the stand No. G.H.J.

* * *

Told at the Overseas Banquet

Applicant for transitional unemployment benefit: Well, guvnor, I don't know wevver to sign 'arry 'all or 'enry 'all. Yus, my wife earns twenty-five bob a week. Yus, I 'ave got six kids all working, hearning anyfink from eight to heighteen and a tanner a week. But I don't know wevver to sign 'arry 'all or 'enry 'all. *Manager*: You needn't worry, old man, you'll get damn all here.

MARKSMAN.

(*Concluded from previous column.*)

taken up by the exhibits and a maximum amount of room for their examination.

The large space taken by the Fordath Engineering Company is now filled with core-shop machinery, whereas when we first remember their exhibits, it was pretty well confined to examples of cores made from Glyso. It presents a very smart appearance and is always the centre of a large admiring crowd.

Centrally disposed in the foundry section is the very fine exhibit of Spermolin. The stand is cleverly laid out and enables one to examine, in complete detail, cores coming from many of the most prominent foundries in Great Britain, some of which have been made on the new types of core-blowing machines.

The general level of stand design is extremely high and those we have indicated are characteristic of strides made in using to advantage the limited space normally available at exhibitions.

Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents]

Brake Drum Design

To the Editor of The Foundry Trade Journal.

Sir,—We note in the August 8, 1935, issue of The Foundry Trade Journal the article by W. A. Geisler, entitled "German Progress in Piston Rings, Brake Drums and other Automobile Castings," to which we wish to take exception.

Our company is the owner of certain patents and applications thereof pertaining to brake drums of the so-called "Centrifuse" class in Great Britain, France, Germany and other European countries, as well as the United States and Canada. We have made and sold to the automotive trade in the United States alone several millions of the Centrifuse brake drums which have been applied to automobiles and have given perfect satisfaction without any complaint.

Mr. Geisler, in paragraph (5) on page 101, discusses the "Centrifuse" drum and says it might be described as a "multiple-assembled" drum and further says: "Thus there is again, substantially, a cast-iron ring located in a mild-steel drum, and the essential difference between the 'Centrifuse' drum and the English type, with liner, mentioned under (1), is that the heat transfer in the former is incomparably better. This is due to the fact that the steel and cast iron having been united by welding a far better transmission of heat from the cast iron to the steel is obtained."

From the above, one is led to believe that the cast-iron braking ring and the thin steel shell are two separable parts in contact with each other, and therefore the heat flow from the cast iron to the steel shell is interrupted. In the manufacture of the Centrifuse brake drum a shell is produced from thin sheet steel by cutting a strip to the required length and width, rolling it into hoop form and the two opposite ends butt-welded together, forming an annular shell of the width of two brake drums with an inturned flange at each of its sides. The formed steel shell is then usually heated by an electrical induction heater to the desired temperature in from 2 to 3 sec. (not 15 to 20 sec.) and placed in the holding chuck of a horizontal spinning machine, which, as soon as the steel shell is gripped by the chuck jaws shaped to conform to the outer periphery of the steel shell, is started to rotate and during the first revolutions of the steel shell, molten iron of high temperature and desired quantity is introduced into the shell. The speed of rotation is then immediately brought up to approximately 4,000 ft. of peripheral speed of the drum shell per min. and caused to revolve at that speed for approximately 2 min., when the drum is removed from the holding chuck with the cast-iron and the steel shell completely and inseparably fused (welded) together throughout their opposed surfaces, as illustrated in the accompanying photomicrograph.

In order that there will be no interruption in production through the introduction of the molten iron to the drum shells, a plurality of spinning machines are employed, arranged at the periphery of a large-diameter turntable by which, as soon as one drum shell is lined with iron, another chuck with a heated drum shell is brought to position for receiving the molten iron which is supplied from an electric furnace. The process of manufacturing the Centrifuse brake drum is substantially a continuous one, 7,500 double-width drums being produced daily which, when separated, constitute 15,000 single drums and when the supporting back is attached (but not as shown in Fig. 21 of the Geisler article) and machined internally, forms 15,000 complete brake drums in which the heat transfer from the iron to the steel is equal to the metals from which the two parts are composed.

Mr. Geisler says "the Centrifuse brake drum is too dear." If he means by "dear," affection, we agree with him; if expensive to manufacture, we disagree, as having manufactured several million Centrifuse brake drums, we should know. The spinning machine is a permanent apparatus, subject to wear only. The steel shell of thin sheet steel costs less than the moulds required in the production of other brake drums. The supporting back is cut from a plate of sheet steel

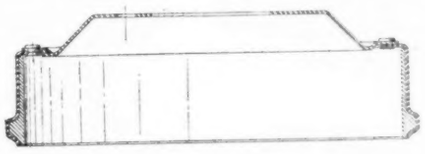


Fig. A.—Details of the Centrifuse Brake Drum.

and simultaneously riveted to the inturned flange of the steel shell. The supporting back, being of smaller diameter than that of those shown in Figs. 19, 21 and 22, is cut from a smaller sheet of steel and therefore of less stock and cheaper to produce. Fig. 21 does not illustrate the correct way of attaching the supporting back of the Centrifuse brake drum, it being attached only to the inturned flange and centred in relation thereto by bosses pressed inward

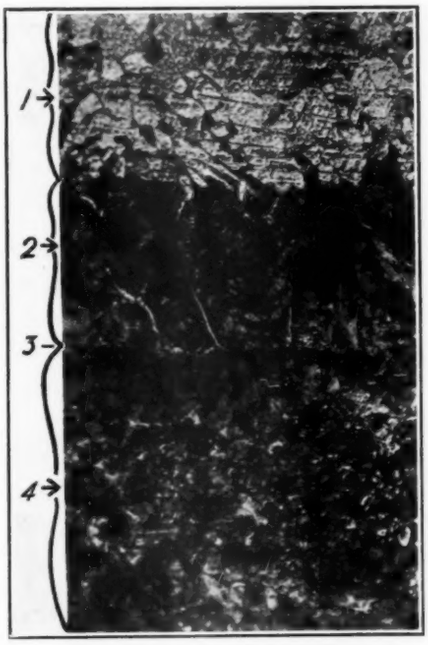


Fig. B.—Section through Fusion Zone. (1) Steel of the Drum Shell; (2) the Cast-Iron Braking Band; (3) Carbon Migration from the Iron into the Steel, and (4) Line of joining Metal. × 150.

from the back to contact the inner edge of the inturned flange. A plurality of rivets, simultaneously headed, secure the supporting back to the inturned flange. We enclose a print (reproduced herewith) of the Centrifuse brake drum showing the attachment of the supporting back.

Regarding the question of strength and lightness, raised by Mr. Geisler, the steel shell enclosing the cast-iron braking band to which it is fused insures the cast iron against breakage from shock, and for that reason the Centrifuse drum can be made lighter than drums whereof the braking band is entirely of cast iron. Also, the heat conduction is equal and the wearing qualities as good as that of the cast-iron brake drums.

The object in writing you on the above subject is that we believe it is your desire to publish for the benefit of the trade only reliable information, and that you may rectify Mr. Geisler's article.—Yours, etc.,

Campbell, Wyant & Cannon Foundry Company,
C. W. Dake.

Muskegon,
Michigan,
U.S.A.

Exhibition Catalogues

Sir W. G. Armstrong, Whitworth (Ironfounders), Limited, Close Works, Gateshead, have not only produced a particularly handsome brochure but have managed to introduce a certain amount of "kick" into it. The letterpress is excellently written and is designed to show the advantages of refined pig-iron. Metallurgical reasoning, accompanied by profuse illustrations and tabular matter make it a very interesting, useful and readable brochure.

Coleman Foundry Equipment Company, Limited, 156, Strand, London, W.C.2. This catalogue is a very human production. It is full of wise saws, which relieve the well-presented technical descriptions of a series of modern foundry equipment. In the opening pages the Coleman core-blowing machine is detailed, as to types, sizes and output. One page is devoted to that very useful tool—a runner bush and riser cup machine. Apprentices often spend far too much time making these instead of learning their trade. Two pages deal with the Coleman-Prosama sand machine, followed by four covering various types of moulding machines. Finally, there are sections devoted to a crucible furnace and a tumbling barrel.

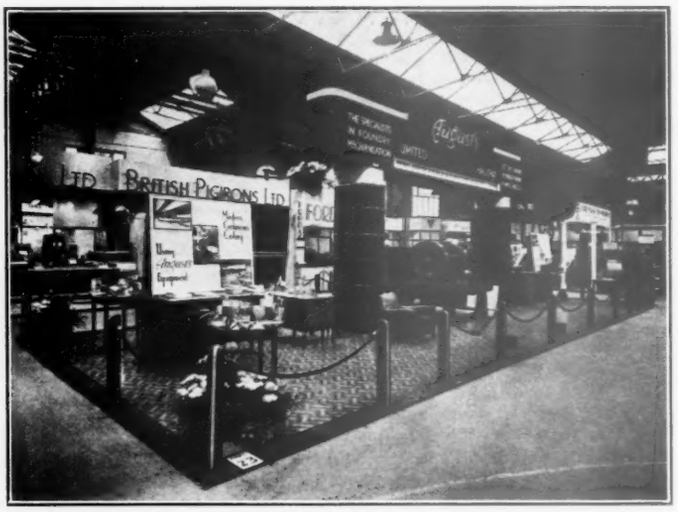
Imperial Chemical Industries, Thames House, Millbank, London, S.W.1, have produced a particularly pleasing brochure for the exhibition. It deals with the success of the soda-ash process in the particular case of the manufacture of 250 tons of castings for a 10,000 cub. ft. compressor, upon which there was only a waster loss of 5 cwts. The illustrations are the very best that have ever been used in foundry commercial literature, and we congratulate the publicity department on the excellence of the results they have achieved.

German Foundrymen's Association

The Verein deutscher Eisengiessereien (Association of German Foundrymen) held its 64th annual general meeting on Tuesday and Wednesday at Bad Harzburg. The council held a meeting on Monday evening and on Tuesday. Dr.-Ing. Geilenkirchen read a report dealing with the market position, and price regulation and fixing in the foundry trades. On Wednesday the Gussbruch G.m.b.H. held its directors' and general meetings, which were followed by a technical meeting of the Association, at which Prof. Dr.-Ing. Paschke read a Paper on the history of iron and Prof. Dr.-Ing. Thum presented a Paper on new knowledge relating to the use of cast iron as a structural material. The general meeting of the Association was held that evening in the large hall of the Kurhaus, and ended with an address on the political and economic situation.

XUM

Some of the Stands at the Foundry Trades Exhibition—

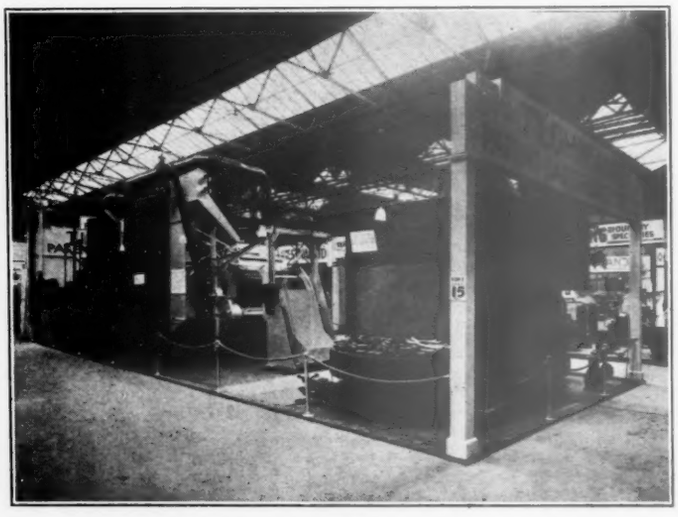


AUGUST'S, LIMITED.

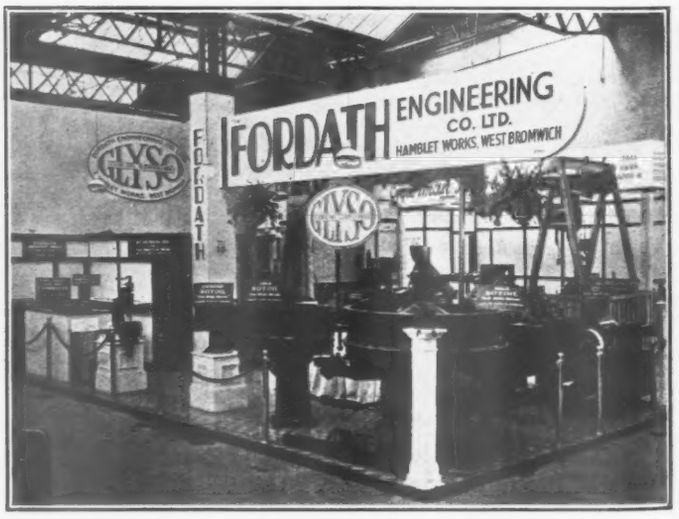
BRITISH PIGIRONS, LIMITED.

THE CARBORUNDUM COMPANY, LIMITED.

THE CONSTRUCTIONAL ENGINEERING COMPANY, LIMITED.



TILGHMAN'S PATENT SAND BLAST COMPANY, LIMITED.



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Modern Machines and Materials in Modernistic Settings

Spermolin, Limited.

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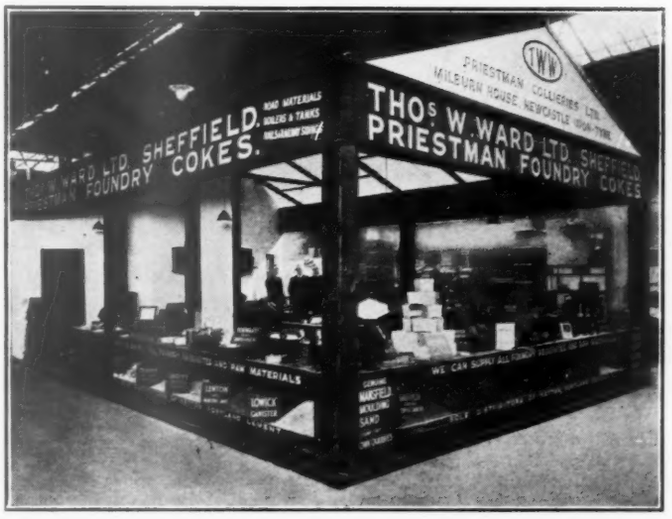
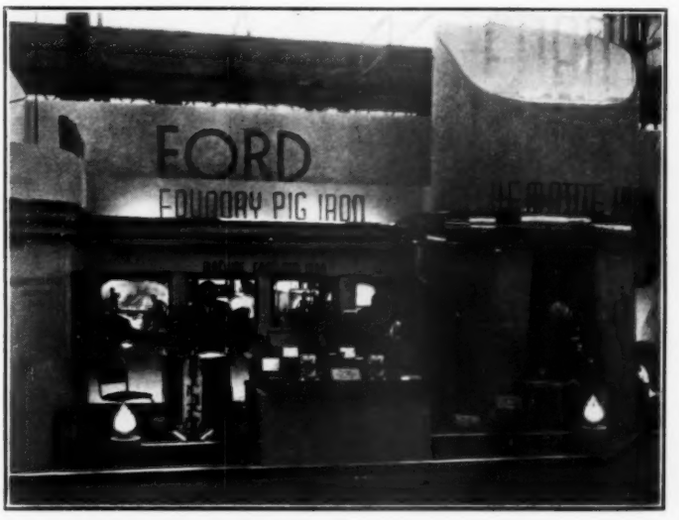
General Refractories, Limited.

The Morgan Crucible Company, Limited.



Thos. W. Ward, Limited.



Ford Motor Company, Limited.

XUM

Firing Furnaces with Pulverised Fuel

SUCCESSFUL OUTCOME OF EXPERIMENTAL INVESTIGATIONS

On a recent visit to the Empire Works of the British Chilled Roll & Engineering Company, Limited, Middlesbrough, our representative had an opportunity of inspecting the initial installation which was recently put down to try out the system of firing the air furnaces with pulverised fuel. At these works there are three of these furnaces in line, of 20, 12 and 10 tons capacity respectively. The first two were fired with solid fuel in the usual manner, and the smaller furnace, in which it is the practice to melt steel as well as iron, is fired with oil. It was not on the question of economy alone that the management decided to try out pulverised fuel, but because also of the possibility it appeared to offer for more uniform melting, in other words, better chemical conditions.

With a view to trying out a system under every-day working conditions, it was determined to convert the 12-ton furnace for pulverised-fuel firing; at the same time, consideration was given to the fact that, if successful, a change-over would be made with the remaining furnaces, and it was therefore decided to install a pulverised unit which should be at least equal to the demands of two of the furnaces and which might possibly, under suitable conditions, meet the demands of all three furnaces. An order for the complete plant was placed with the Buell Combustion Company, Limited, of London, and the installation was carried out on their system, which has previously been fully described in our columns.

The pulveriser, which is driven by a 25-h.p. motor, is capable of delivering from 18 to 22 cwts. per hr., and the fan, an integral part of the pulveriser, delivers the pulverised fuel into the top of what might be called a receiver, though it would also function as a reservoir to maintain the furnace in operation in the untoward event of the pulveriser being temporarily out of commission. As a matter of fact, the capacity of the cylindrical receiver is such as to bridge a gap of 4 to 5 hrs. The receiver is, of course, always kept full, and with the furnace in operation there is no excess air to be dealt with; at the same time, the top of the receiver is fitted with a cyclone in which the dust is extracted from any air which has to be passed to atmosphere.

The bottom of the receiver feeds to a Redler-type conveyor, which delivers to the fan for supplying the burners with fuel and primary air. The Redler conveyor is driven by a ½-h.p. motor and the fan by a 4-h.p. motor. The secondary air is delivered by a fan driven by a 3-h.p. motor, the delivery from which is controlled by a butterfly valve. In considering the powers of the various motors, it must be borne in mind that they, as is also the pulveriser, are wholly above their present duty.

The plant being regarded more or less as experimental, its arrangement and auxiliaries are of a purely temporary character; thus, for the time being, the feed hopper for the pulveriser is charged by hand.

It is worthy of note that only the highest quality of dry-cleaned nuts coal is used. Originally a lower-grade fuel was employed, but the management speedily determined that the higher price of the better fuel was more than justified. The initial installation having come fully up to

(*Concluded on page* 218.)

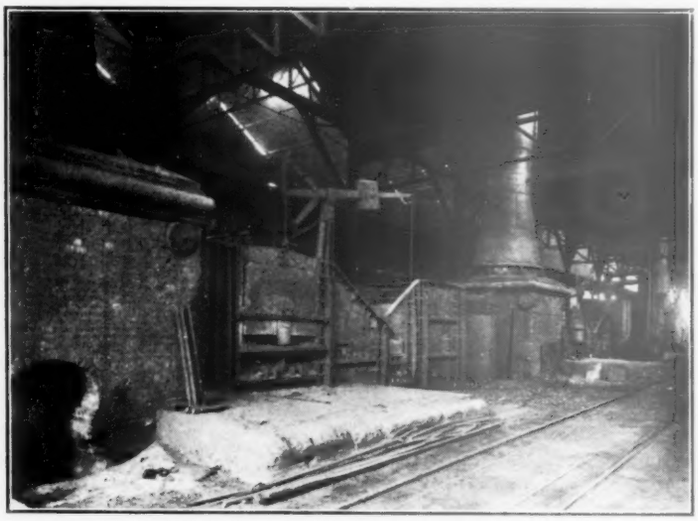


FIG. 1.—GENERAL VIEW OF FURNACES SHOWING PULVERISED-FUEL PLANT IN RIGHT BACKGROUND.

FIG. 2.—VIEW OF FURNACES FROM OPPOSITE DIRECTION TO FIG. 1, SHOWING PULVERISED-FUEL PLANT IN DISTANCE.

FIG. 3.—NEAR VIEW OF PULVERISED-FUEL PLANT AND HOPPER.

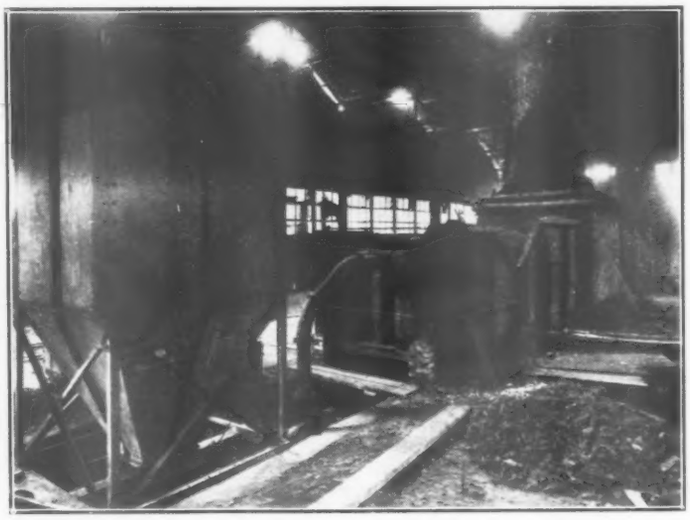


FIG. 4.—NEAR VIEW OF PULVERISED-FUEL HOPPER AND DUCTS TO FURNACE.

Castings

By W. MACHIN and M. C. OLDHAM

(*Continued from page* 170.)

Coremaking

The greatest care is necessary to ensure that cores are manufactured so as to offer a minimum of resistance to the contraction of the metal, and this is of the greatest importance in the production of steel castings. It is a simple matter to produce a core reinforced with a large cast-iron grid, and the core made in this manner may appear to be all that is desired from the point of view of symmetry, but it will probably be useless so far as the production of a sound casting is concerned.

In the cores required for turbine and pressure work, experience shows that they must be built in a manner just sufficiently strong to hold together, to withstand the wash of molten metal and resist the pressure in the mould during casting. Such cores are essential for the manufacture of steel castings, and are built up of loose irons of just sufficient thickness to do the job, tied together in the form of a cage, as shown in Figs. 92 and 93. These irons, being loose, offer no resistance to the crushing of the core during contraction, bending easily when heat is transmitted to them from the metal, immediately the mould is poured. Comparatively slight thicknesses of sand are used, which, heating up and becoming soft, act similarly. This inner part of the core can be made with a mass of cinder material, which crushes when the walls of the core are subjected to the pressure of contraction.

Cores are also manufactured in various oil-bonded sands without using core irons, but it is doubtful whether such are suitable for many types of castings owing to their resistance to contraction. Oil sand has many applications, but should be used with careful judgment, or a stronger core may be produced than even that in which cast-iron grids are enclosed.

The large core shown in Fig. 94 was made with loose irons, cinder material and a 2-in. thick wall of sand on the surface. It was reinforced with a loose iron cage of a thickness and strength just sufficient to carry the core to its position in the mould. Cores of this description have frequently been made above 12 ft. in length, approximating 4 ft. in diameter, the object being to obtain a weak core which would not offer any resistance to the contraction of the casting.

The large cast-steel wheel shown in Fig. 95 is over 16 ft. dia., contraction over 3 in., which means the casting is 3 in. smaller when cold than the mould. It will be appreciated that cast-iron grids used in cores which are fitted close to the inside of this casting would retard the contraction and probably cause serious hot tears. If the wheel were made in cast iron under such conditions, serious contraction strains in the arms of the casting may cause trouble in service on account of such castings not being annealed to remove the strains.

The manufacture of a large core, such as is shown in Fig. 96, where very heavy sections of metal exist, is in come cases carried out with a cast-iron grid embodied, but the grid is kept small, and is only used to fasten the two halves of the core together, and to convey it into position in the mould, the remainder of the core being built with loose irons. The grid will be noted in the centre.

The loose iron cage which carries the three external belts of cores is assembled by means of other irons fastened horizontally with the corebox, these being seen in the corebox. The whole of the cage is then attached to the cast-iron grid, therefore the core iron is not as rigid as would have been the case had they been cast on to the grid and run right into these projections. As is shown by Fig. 97, the whole of the weight is being taken by the grids, the two pieces having been fastened together to make the complete core.

The type of grid used in the manufacture of this core can be freely broken through its centre after casting, the whole of the loose irons are then free to move, and having been heated up by the temperature from the metal being transmitted to them, they easily give way when the contraction commences to press against the surface of the core. It will be appreciated that the manufacture of cores on the lines indicated is very highly-skilled work carried out by clever craftsmen, and experience is necessary before such work can be satisfactorily accomplished.

Supervision of the highest degree is essential to ensure that the points outlined are carefully and accurately observed, otherwise those results necessary to meet inspection and specificational requirements will not prevail. Cores required for castings in iron and practically all the non-ferrous alloys, are not so vitally important from this viewpoint of contraction, and therefore oil sand may be used more extensively; also greater risks may be taken in instances where core irons are used without oil sand. On the other hand, even in these cases, cores that are made on as weak lines as possible give better results, ensuring less contraction strain in the casting when it reaches normal temperature.

It must be appreciated that if contraction in iron and brass is not normally obtained, stresses will exist in the finished casting, which, though not observed with the naked eye or even under X-ray examination, constitute a hidden weakness which will sooner or later develop a defect under shock load. Similarly, such stresses in castings, subject to extreme variations in temperature, may bring about cracks during service.

The proper venting of cores is another essential point which requires most careful consideration, also their assembly in the mould, in order that the core vents may be linked through the mould to the outside of the moulding box, otherwise serious defects are bound to appear in the casting.

The Wood and Water Method

The foregoing remarks have briefly indicated the types of mould and core considered the best to allow of contraction being obtained on steel, iron and brass castings, without any serious defect developing in the casting, but there are numerous methods in use in this and every other country. It has been suggested only recently, that blocks of wood be carefully embedded at various points in the mould or core, and after their removal water should be poured into the aperture just after the mould has been cast.

The method has been tried with the supposition that the water would soon boil, thereby destroying the bond in the sand, which breaks up in the mould quickly, and allows the casting to contract at that part. Apart from the danger associated with such a method, it is extremely difficult to appreciate how such could become a practical proposition, and, in addition, it is difficult to understand how it could be useful, as the cooling would be localised, and would tend to accelerate contraction at local parts where it might be used, and thus throw the casting out of shape or crack it elsewhere.

Fig. 98 illustrates a method which has been found very effective, and is more practicable. The thickness of the wall of sand encircling this core must be determined by the weight and thickness of the casting. The wall referred to is shown at "A," and the part marked "B" can be packed with dry cinder material, whilst that marked "C" shows three grooves made in the core by means of wood strips, which are placed in the corebox before core manufacture commences.

Here again the distance from the corebox at which these strips are placed can only be deter-

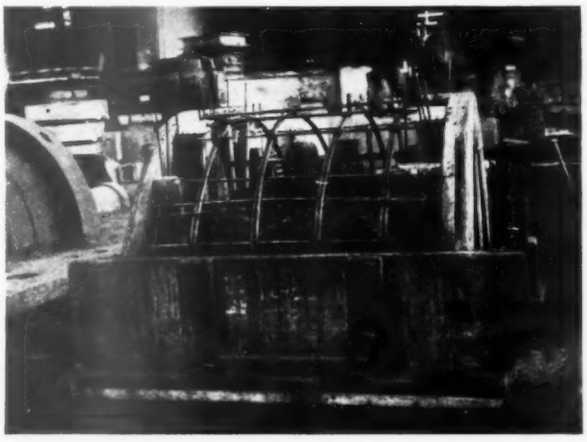


Fig. 92.—Irons Bent into Shape ready for Building up the Core.

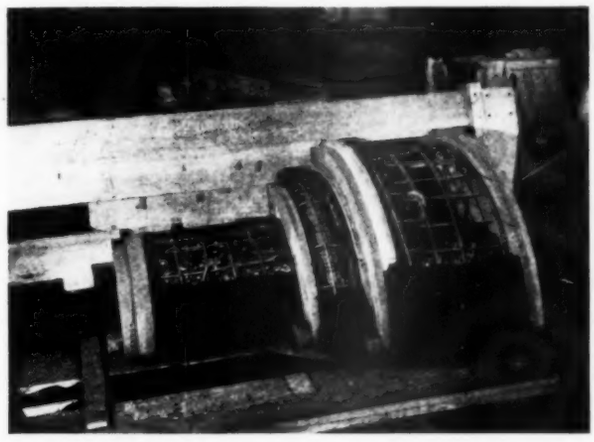


Fig. 93.—Core Partly Packed in the Centre with Cinder Material.

mined by the weight and thickness of the casting being dealt with, but, assuming that a core is being made 12 in. dia., the strips for the grooves could commence at 2 in. and taper down to ½ in., the ½-in. end being placed ¾ in. from the face of the core. When these strips are drawn away from the corebox, they can be filled with a sea sand, or any other fine silica sand which will run when dry. This sand can be backed with a pad of floor sand, shown at "D," and the cinder material afterwards packed in.

On the other hand, governed by the class of casting being dealt with, the mould could be cast with such a core in skeleton form without any packing at "B," "C" and "D." If a core iron is used on such cores, it could be carried through the gaps as shown at "E," or if made in oil sand, in many cases no core iron would be required. Cores of many kinds could be split with these gaps, as shown at "F," and afterwards built up, but it has been found they can be made in one piece without any difficulty by a good craftsman.

FIG. 94.—LARGE CORE FOR A CAST-STEEL HALF-TURBINE SECTION.

FIG. 95.—CAST-STEEL WHEEL.

It will appear difficult to understand by the non-technical person why all this procedure is necessary, but to the technical person with experience it is obvious that the small web of sand between "C" and "G" will soon get hot after the mould has been poured, and thereby become weak at that part, and thus allow the core to collapse under the slight pressure load of contraction.

A Tunnel Analogy

In addition to this, during the easing operation or removal of the cores from the casting whilst it is hot, the core irons can be struck in these grooves with a bar, thereby causing the core to break up easier, and saving much time, which is important at this period of the work. A round core which has been dried is similar to a tunnel so far as strength is concerned, and the coremaker should endeavour to see that the key brick is easily removable in any core he makes, so as to enable same to collapse, as would be the case with a tunnel or arch when the key brick is removed.

Choice of Sands

Another very extensive and important phase connected with the foundry is that of the correct classes of moulding and core sands, and it goes without saying that this is one of the most important subjects, if good results are to be obtained. Much has been published recently concerning the scientific control of foundry moulding and core sands, also on the question of synthetic sands. In the latter case, one might suggest that these classes of sand have been used over a great number of years, and there is nothing new in their use, so far as the practical side is concerned.

In the selection of a sand to make a mould or core, one has to consider how it will stand up to the method of running, *i.e.*, is the job being cast from the top or bottom of the mould, or is it to be cast on a declivity? The position in which a job is run is a very important factor in obtaining a good casting (this has been referred to previously). The selection of sand, therefore, needs to be made to meet these conditions, as moulds cast from the top or on a declivity will break up on the face if the sand is not correctly selected for such methods.

A perfect-looking steel casting, on the skin, can be obtained with very cheap sand, under some methods of running. One has to look a little further than this, however, if quality castings are required, and, in doing so, one will perhaps have to pay a little more for the sand, as it is the finished-casting result which is of major importance.

Temperature of Moulds

The higher the temperature a dry-sand mould for a steel casting is cast the better it is, as the sand in the mould and core becomes soft sooner when the heat is transmitted from the metal. This condition then surely assists the contraction and helps considerably to keep away hot tears from steel castings. A great deal of excellent work in connection with moulding sand for cast iron has been done in recent years by the B.C.I.R.A., and this work should have assisted very much foundries manufacturing standard products which are of a repetition nature, on which the sand can be kept at a constant quality. In foundries not dealing with repetition work, however, much different treatment is necessary.

Repetition work is invariably moulded in green sand, and the sand under these conditions is easier controlled scientifically than in a foundry which is working on green sand, dry sand and loam work. In addition, the repetition product manufactured on a green-sand basis is generally a design of casting kept constant as regards thickness, and any changes that do take place are usually of very minor nature and cause little variation in method of manufacture.

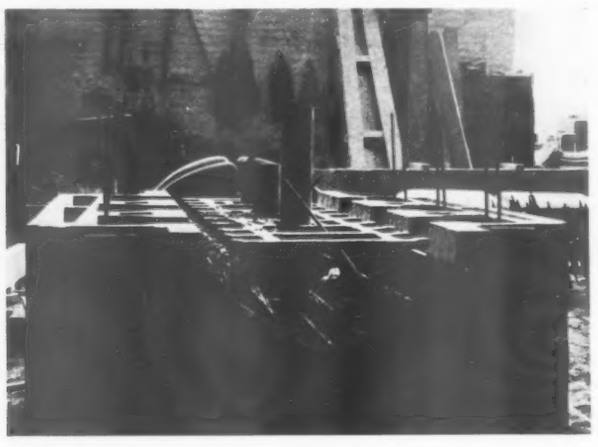


FIG. 96.—MANUFACTURE OF CORE FOR A 25-TON CASTING.

Grain Splitting

During recent months much has been written concerning bonding clays, regarding which the addition of pounds or ounces will make floor sand last for ever, with small additions of silica sand. These procedures need very careful thought before being put into use, otherwise the foundry commitments may soon lag behind in deliveries, due to trouble that may be experienced after a short period of working. The continuous cracking of the grain is the result caused by the

FIG. 97.—THE CORE COMPLETED AND BEING LOWERED INTO THE MOULD.

molten metal coming continually in contact, and this condition makes the floor sand fine.

An instance of this is illustrated by a silica sand which was recently tested in its normal condition by being heated up once to 1,400 deg. C., which is about the usual modern casting temperature for cast iron. This silica sand as received from an English supply was of very good quality, and 0.4 per cent. passed through a 200-mesh sieve in its normal condition after being dried. After heating at 1,400 deg. C., 2.1 per cent. passed

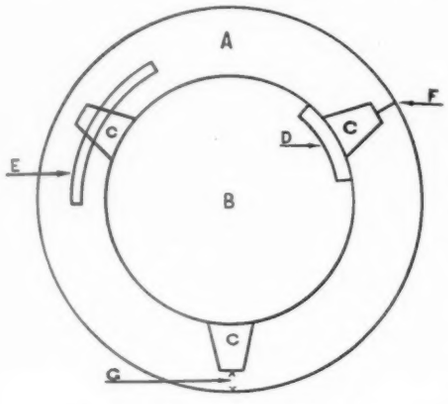


Fig. 98.—A Section of a Round Core.

through the same sieve, thus showing a splitting up of the grain to the extent mentioned with the one heating.

It is therefore reasonable to assume that by continual heatings of this description taking place day after day in the foundry when moulds are cast, the grain size would continue to break down in such manner that it would become as fine as gunpowder and permeability would entirely disappear.

New sand, therefore, should be used in a sufficient proportion to meet this condition, if these clays, which are recommended so much, be used. One of the clays in use, on being passed over a 200-mesh sieve, 83.7 per cent. passed through, which gives an indication of its fine silky nature If large quantities be used, one can appreciate what condition such material will finally leave floor sand in after a few weeks' use, so it is necessary that careful consideration be given before commencing.

One wonders why fireclays should be used for the purpose described when such excellent natural sands are obtainable locally in practically every district throughout the country, especially for use in iron and non-ferrous production. The B.C.I.R.A. have published a list of these local sands, which can be obtained at very small cost in all the districts throughout the country, and, carefully handled, such sands give the results generally required without resorting to such fine powdery materials. When everything is calculated, what saving in cost is obtained as against the use of natural sands? In this respect much depends on the district.

It cannot be stated that the local sands referred to can be generally used on a standard mix with success on any thickness of casting, but the foundryman, by adding a little more new sand to his floor sand, to meet heavy-section thicknesses, can generally get better results than can be obtained from the use of other materials.

In the production of steel, however, long experience has taught one that synthetic sands are the best to use. The high temperatures at which steel is cast make it essential that highly-refractory materials only be used in the manufacture of moulds and cores. In addition, the synthetic sands made from them must be sufficiently bonded to withstand the wash of the metal, especially so when runners are placed at the top of the moulds, which, as has been stated, is the best position in which to place them to obtain sound castings.

There are many classes of moulding sands in use for steel-casting production in this country and abroad, but a better class of natural sand seems to be available for steel on the Continent than in England. In foundries where repetition work only is made, one class of sand can be conveniently used, and good results obtained, but, unfortunately, this cannot be done satisfactorily in foundries dealing with different types and classes of work.

The main reason is, that castings of heavy and light type cannot be successfully made unless the facing sand is graded to withstand the high temperature at heavy parts, and to be weak enough at the light parts not to retard contraction. To sum up, the only practicable method known is to make a variety of sands to meet the variety of castings and the varying thicknesses relating thereto.

It will be seen from Fig. 99 that the heavy body of metal round the boss has caused the sand to break up and the metal to eat its way into the face. The same remarks apply in the case of the extra metal thickness on the arm, where it will be seen the sand has failed to stand up. It will also be observed that the sand on the thinner sections has stood up much better, the casting being cleaner at those parts (Fig. 99). The break up of this sand was caused through its bond being insufficient to bind the grains of the refractory materials together. The trouble was not due to soft ramming or packing of the sand round the pattern, as may be surmised, the mould being carefully examined as to this after the pattern was drawn.

It has been mentioned that synthetic sands are the best to use for the making of moulds where a variety of steel castings are produced, the reason being that grades of sand can then be made of varying bond strengths.

The bond is obtained by adding a siliceous clay to the refractory materials in use, these materials being as follow:—Belgian silica sand; English silica sand; ganister stone, ground after being burnt to 850 deg. C., which can be done at little cost during the annealing of castings; old firebricks, and reclaimed sand from castings. The purer in silica the moulding sands are, *i.e.*, the least amount of fusible material contained therein, the more refractory is the sand, and the better will it withstand temperature.

It is not always desirable to have the sands too pure, as in this condition they break up too readily, and cause what is shown in Fig. 99. Therefore the mixtures sought are those sufficiently strong in bond so that they will hold together during the casting of the mould and the cooling to solidification stage. In addition, they must be sufficiently weak in other places not to retard contraction from solidification until the casting is cold.

Of the materials mentioned, Belgian silica sands are probably the best from a refractory point of view, as they can be obtained much purer than English grades; also, they are of more regular grain size. English silica sands are used in many foundries, but do not resist temperatures in steel-casting production so effectively as those from the Continent. When using those sands, it is necessary to add some bonding material in order to make them sufficiently plastic to hold together, otherwise a mould or core could not be made from them.

The grades of silica rock, or ganister stone obtainable in this country, are also varied in quality, but excellent materials are available which contain up to 97 per cent. silica. These, when treated, are very good for use in synthetic steel moulding sands, but here again, bonding materials are required to give the strength for moulding purposes. The best quality known to the authors is obtained from the Welsh coast, a large deposit being in existence there on which a great deal of scientific research work could be done to advantage.

Old firebricks, which have been in fairly high temperatures, are also a good material after all slag is removed. The best refractory, however, is found to be the old clay crucible pot, which has been used for the melting of steel. This material is the best known in connection with synthetic-sand mixtures for steel production, especially on cores for pressure castings.

The method to use is to clean away any slag and then grind the material until it will pass through a $\frac{3}{32}$-in. sieve. It is then used with other siliceous materials which have been mentioned, together with old facing sand gathered from the castings. If these materials are used and prepared carefully, the sands produced therefrom give less trouble than many of the facing sands at present on the market in this country, *i.e.*, for the varied classes of moulds, and especially for cores used in pressure work.

Mould Facings

The question of paints for facing cores and moulds should be very carefully considered, as they should only contain small amounts of any materials which fuse below the casting temperature of the metal. In addition, it is necessary to have them fine enough to penetrate between the grains of sand all over the face of the mould. Also, the bonding material used should be highly refractory. A very satisfactory and reliable silica paint is produced in Wales, but good paints can be made by the user. The quality is then controllable, as it is easy to keep constant on account of being mixed in one's own mills—a small ball mill only being necessary for this purpose.

Fig. 99.—A Casting made in a Sand which had been Prepared to Mould a Lighter Class of Casting.

XUM

Tar-bonded sands have been spoken of recently as being useful on account of their easy collapse when the metal comes in contact. These sands have been used extensively in the past, and provided they are used in a proper manner, excellent results are obtainable, but only a very small quantity of tar is necessary. The authors are not, however, generally in favour of the use of tar facings, on account of the potential carbon pick-up by the metal, which it has been definitely proved takes place. In addition, all moulds on which tar is used in the facings should be subjected to high-temperature drying, so that there is no possibility of gas being generated, as such gas is the cause of serious defects.

Lines for Research

It has been noted that research work is proceeding on moulding sands, and, in the opinion of many, the best lines on which to proceed would be to give greater attention to sands for use in steel foundries, as when research work has been successful on these, iron and non-ferrous problems in this connection will be more easily solved, as the casting temperatures are so much lower. The technical side should work closely in touch with the scientific side to obtain the desired result.

The subject is a very large one, and, as pointed out, sands are required to serve so many purposes in the manufacture of reliable steel castings, especially for pressure service. Research needs to adhere closely to contraction troubles, otherwise progress will not be made. The foundryman should give his views and table his troubles so that he may be assisted fully by such research work.

Sands require the most urgent investigation, and any committee formed to deal with the subject should be a combined one of those who have had long practical experience on the one side and on the other, scientists who are not afraid to come into the foundry and investigate fully the practical man's troubles. In addition, the best known refractory materials should be all gathered together and tried out under varying conditions.

Labour Selection

The selection of craftsmen, that is the moulder and the coremaker, is also a very important question where the quality of the finished casting is concerned, and, in a foundry where varying classes of castings are manufactured, *i.e.*, structural work, land and marine turbines, Diesel engine work, and castings which are required for gun-mountings, it is most important that the foreman in the foundry should know each of his men who are competent to handle the complicated castings on the lines indicated. Moulds and cores should not only be made to look well finished on the moulding floor, but they should be built on sufficiently weak lines, otherwise the desired result is not obtained.

Foundries that have been producing an article on repetition basis, are usually worked with what are called semi- and un-skilled labour, and, generally, this type of labour is useless in foundries producing the class of castings dealt with, and the same remarks apply to what are called the skilled class of moulder and coremaker who have been used to producing plain types of castings, as moulds for such castings do not require the treatment necessary for pressure and other complicated work.

It is, therefore, essential that the supervisor in the foundry pick out the highest-skilled craftsmen to handle the more important moulds and cores to make sure they be made on the lines indicated as there is a great difference in the grades of ability of moulders and coremakers.

(*To be continued.*)

AFTER SUCCESSFUL PRELIMINARY TRIALS the London Midland & Scottish Railway have placed in regular main-line express service their experimental turbine-driven locomotive—the first to be built in a British railway company's own works.

Foundry Selling Practice

THE NEW SALESMAN

By ERIC N. SIMONS.

In a previous article the choice of a new salesman to replace a predecessor in a particular territory was discussed. Assuming that a wise choice, on the lines suggested, has been made, an important part of sales tactics consists in introducing this new man to his future and existing customers as quickly and tactfully as possible.

For the purposes of this article, it will be taken for granted that the new representative is not already familiar with his district, *i.e.*, is not an imported man with an existing "connection." It is taken for granted, also, that he is familiar with the foundry, and does not need a preliminary training period. In regard, then, to his introduction to the district, two possibilities arise: (1) either the preceding representative is available (and well disposed towards him) for a short period, as, for example, when an older salesman is retiring, or is taking up a different post elsewhere; or (2) the preceding representative is either not available or is not well disposed towards him, as may happen in cases of dismissal. In the first instance, the matter of introduction to the territory is much simplified, since the old representative may take the new man about with him for, say, a month, and introduce him to all the people who count. Nevertheless, even in these instances a good deal of work needs to be done and is often neglected, as will be seen.

In the second instance, the new representative is left largely to his own devices, having no one to help him to introduce himself. This may happen where the older man has died suddenly, or even where the district to be worked is a completely new, or redrawn, one.

Preliminary Prerequisites

Wherever this happens, the new representative should, with the co-operation of the foundry sales department, prepare himself thoroughly in advance for his district. There is no real excuse for the fumbling and haphazard manner in which certain men set to work to cover their new areas. The first requirement is a complete list of all the firms and persons with whom the foundry has had any business connection whatsoever, of a sales character, *i.e.*, it should include not only actual customers and firms who have sent inquiries, but also those who have been called upon hitherto in vain.

This list is most satisfactorily compiled from the sales records, where these are kept, as they should be, in a systematic form. The sales department should co-operate by undertaking to supply the new man with this information. The heads covered should include the full name and address of the firm; the date of last order or inquiry, if any; the type of castings in which they are or might be interested; the name of the important men to interview; and any facts of definite importance affecting sales. The list should be typed on quarto sheets and grouped in towns or districts.

The next requirement of the new man is a complete set of all the publicity literature issued by his firm, including price lists, and a price book, if the foundry sales department is able to issue such a publication. This literature he should study, because he may have occasion either to use or to criticise it during his travels, and it may at certain times prove the clinching point in a discussion.

His next aim should be to procure from the sales department a proper printed map of his area, exactly defining its boundaries, and leaving no doubt as to whether Blankville is or is not in his territory. Large scale maps of Great Britain can be purchased, and the specific area cut out from one of these and pasted on to a sheet of stout cartridge paper. Thus treated, it constitutes an excellent reference map, which will be most valuable.

Mapping Out the Operations

The representative should consult his area map in conjunction with his list of prospects, and endeavour to plot a number of detailed localities that he can regard as his centres for individual journeys. If, for example, he is taking the South of England between Croydon and Southampton, he will possibly take Croydon itself as one centre, Basingstoke as another, Southampton as a third, Brighton as a fourth, Canterbury as a fifth, and so forth. According to the number of foundry prospects in each of these areas, he will endeavour to plan his sojourn in each centre in advance. Croydon may need two days, Basingstoke one, Southampton three, and so on. This will enable him to decide in advance, with a margin for alterations of itinerary, of course, what districts he will cover in his first, second, third and fourth weeks. This planning of definite centres in advance is of great benefit, because it prevents too much haphazard travelling. Railway and road routes, according to the mode of travel adopted, should be carefully considered from this point of view. A bad railway centre may be quite a good road centre, and *vice versa*. All these points have a bearing on the amount of time wasted in getting from prospect to prospect, and the new man, it must be remembered, is likely to lose a great deal of valuable time in this way if he is unfamiliar with the district, unless he has had the forethought to plan in advance, as suggested here.

He is now, on the whole, well prepared for his first journey into the area; but before he actually begins, there are a number of ways in which the sales department can facilitate his difficult task of breaking new ground. If the older salesman is not available to "show him round," some other means must be adopted (and should be adopted, some of them even if the predecessor is at hand). One of these means is to make a preliminary announcement of his appointment, accompanied by a photograph, in the technical Press, and as many foundry or engineering papers as possible should be given the news and asked to publish it. Many will do so, if the foundry is one of standing.

In addition to this, a good plan is to circularise existing customers, and solicit their friendly reception of the new representative. A letter of this kind should, however, be tactfully worded. The outgoing salesman will doubtless have a large number of personal friends in the territory, whatever his faults or failings, and any letter of this type should carefully refrain from either suggesting or implying that the new man is regarded as an improvement upon the old. Give as much credit to the previous man as is consistent with honesty, and rather hint that the new man has a big task before him than say that he is certain to make friends wherever he goes. If there are facts about the new man that of themselves indicate his abilities, give them without comment. They will of themselves suffice to impress the customer. Thus, if the new man is a B.Eng. or a D.Sc., let the fact appear, but do not rub it in.

Almost inevitably, wherever the cause is not immediately apparent, the new representative will be asked by his customers what has become of his predecessor. If the reason for the change is not one that redounds to the latter's credit, the new man should be discreet, and say as little as he can. He will not lose by it.

One thing that invariably happens to the new representative is that his customers rake up for his benefit all the old remembered grievances they have against either his firm or his predecessor. He should then beware of falling into a trap that has caught many beginners. He should

(*Concluded on page* 216.)

The Electric Furnace in the Non-Ferrous Foundry

By A. G. ROBIETTE, B.Sc.

(*Concluded from page* 133.)

Power consumption is often a vital factor affecting the economies of electric melting. It will vary somewhat with operating practice. The type of charge has a bearing on this factor. Large heavy scrap takes slightly longer to melt, consequently the power consumption is higher. Light assorted scrap may show a saving of 4 to 8 per cent. in power consumption. The pouring temperature also comes into play. For one type of alloy power consumption is very nearly directly proportional to the operating temperature. Alloys varying in composition even in one series such as the brasses, can absorb widely differing quantities of heat, to raise their temperature to a certain degree. Users however are occasionally accidentally misled by furnace makers who may for instance quote a certain figure for a brass meaning a 60/40 mixture whilst the user may be concerned with a red-brass foundry mix averaging 85/5/5/5, the power consumption for which is some 40 kw.-hrs. per ton more, due largely to the high casting temperature. Generally speaking, for copper-rich alloys, the higher the copper content the higher is the pouring temperature and the consumption of energy.

The theoretical heat content of pure copper, zinc, lead, tin and aluminium at different temperatures is given in Table II; and since the

TABLE II.—*Heat Content of Pure Metals (in kw.-hr. per ton).*

	1,000 deg. C.	1,100 deg. C.	1,200 deg. C.	1,300 deg. C.
Copper	182	195	207	220
Zinc	152	166	179	192
Lead	45	49	53	57
Tin	78	84	90	95
Aluminium ..	405	435	465	495

total heat of any alloy is the additive sum of the heat contents of its components the theoretical energy consumption can be computed for any particular alloy. When the power consumption for a particular mixture is known the furnace efficiency can be calculated and the actual power consumption can be readily determined fairly accurately.

Table III gives representative power consumption data obtained in the rocking-arc furnace for different alloys.

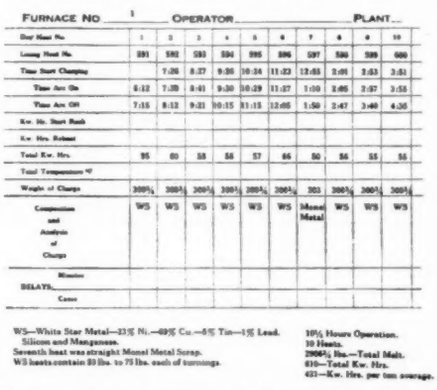
TABLE III.—*Consumption in kw.-hr. per ton for Brasses and Pure Copper.*

	60/40 Brass. (1,000 deg. C.).	70/30 Brass (1,100 deg. C.).
Continous working ..	240	270
Intermittent or day working	260	290
	85/5/5/5 (1,200 deg. C.).	Pure copper (1,250 deg. C.).
Continuous working ..	280	305
Intermittent or day working	300	325

Refractory Materials

This is another equally important factor from a user's point of view. Crucible costs in pit-fired practice are admittedly high, whilst waste of metal due to cracked crucibles must also be brought into consideration. The rocking-arc furnace gives conditions which are less severe than in the crucible owing to the fact that the greater part of the refractory is continuously washed by molten metal. The areas most subject to wear are the roof and the portion around the door. This latter can be quite easily and effectively patched whilst the furnace can be occasionally reversed, making the roof the hearth and *vice versa*. Worn portions can be readily patched at week-ends and with careful maintenance it is possible to obtain an almost phenomenal life. Wear of the lining is not sudden or spasmodic unless severe fluxing treatments have been practised so that defective portions can be remedied in good time.

Various kinds and forms of refractories have been tried and used in the rocking-arc furnace. High-alumina firebrick will give a satisfactory life on brasses although the tendency at present is to use a more highly-aluminous material. A rammed-refractory lining can be made though this means special pneumatic equipment and skilled labour, the operation is lengthy and entails careful drying out and "burning in." Pre-moulded shapes previously fired are quite satisfactory and will give almost equally good service.


FURNACE NO. 1 OPERATOR PLANT

Day Heat No.	1	2	3	4	5	6	7	8	9	10
Long Heat No.	591	592	593	594	595	596	597	598	599	600
Time Start Charging		7.26	8.27	9.26	10.24	11.23	12.55	2.01	3.53	5.51
Time Arc On	6.12	7.30	8.41	9.30	10.29	11.27	1.00	2.05	3.57	5.55
Time Arc Off	7.15	8.12	9.21	10.15	11.15	12.05	1.50	2.47	3.40	6.35
Kw. Hr. Start Rush										
Kw. Hrs. Reheat										
Total Kw. Hrs.	95	80	55	55	57	55	50	55	55	55
Total Temperature °F										
Weight of Charge	200½	200½	200½	200½	200½	200½	203	200½	200½	200½
Composition and Analysis of Charge	WS	WS	WS	WS	WS	WS	Monel Metal	WS	WS	WS
DELAYS—Minutes										
DELAYS—Cause										

WS—White Star Metal—33% Ni.—69% Cu.—6% Tin—1% Lead. Silicon and Manganese.
Seventh heat was straight Monel Metal Scrap.
WS heats contain 20 lbs. to 75 lbs. each of turnings.

10½ Hours Operation.
10 Heats.
2004½ lbs.—Total Melt.
610—Total Kw. Hrs.
457—Kw. Hrs. per ton average.

FIG. 5.—DATA SHEET OF ROCKING FURNACE OF 250-LB. CAPACITY MAKING NICKEL ALLOYS.

For the smaller sizes of furnace, that is, up to 500 lbs. in capacity, a duration of 5,000 to 6,000 heats is common on foundry brasses, but a figure of 2,000 to 3,000 heats is a truer average. Much depends upon the handling of the furnace, fluxes used for cleaning out, pouring temperature, condition of the scrap, and the care or otherwise with which defective or worn spots are made good.

Larger furnaces of a half-ton or more in capacity generally give 800 to 1,600 heats. On brasses, the cost of refractories need not exceed 2s. per ton and with care this figure can be curtailed to a 1s. to 1s. 6d. per ton. Copper-rich alloys exceeding 90 per cent. copper give a life of 500 to 800 heats, whilst nickel alloys show a duration of 300 to 500 heats, but much depends upon the factors noted above. A critical review of the experience on refractories of a large number of rocking-arc furnaces is contained in an article by H. M. St. John* which gives the answers to a questionnaire circularised by the American Foundryman's Association to all foundry users of electric furnaces in America.

Metal Loss

The question of metal loss during melting is one on which there is recorded much conflicting data. It is admittedly a difficult factor to determine, especially over short periods. Most of the loss incurred during melting is usually due to oxidation, and this is especially serious in the case of light scrap. Assume, for instance, that a charge with an average thickness of $\frac{1}{16}$ in. (taken to represent a charge partly of heavy pieces and partly of light swarf), formed during melting an oxide film of $\frac{1}{1000}$ in. thickness. This would immediately mean that the loss from this cause would be 2 per cent. An actual test conducted on a piece of brass which was heated to just short of its melting point over a period of $\frac{3}{4}$ hr. indicated that the film of oxide was of the order stated above.

There is no way of effectively minimising this loss due to oxidation or drossing except by maintaining a reducing or neutral atmosphere in the melting chamber. An expedient often resorted to is the use of charcoal which consumes some of the oxygen filtering into the furnace. It does considerably reduce the loss at high temperature but is comparatively ineffective in the lower temperature ranges (below 650 deg. C.). In the rocking-arc furnace the atmosphere is naturally reducing throughout the heat. The oxygen originally in the furnace is rapidly consumed by the incandescent electrodes and after that any slight diffusion of air is rapidly burned. The furnace is actually operated under pressure and flames of carbon monoxide can be seen issuing from the pouring spout during melting, if this be not plugged up. An investigation of the atmosphere obtaining in the rocking-arc furnace was conducted by the U.S. Bureau of Standards and it showed no more than a trace of oxygen during the melting period, the main constituents being CO (30 to 40 per cent.), CO_2, and nitrogen. This feature practically eliminates the oxidation factor.

The other serious loss of metal is due to volatilisation of such elements as zinc and lead which have boiling points of 900 deg. C. and 1,550 deg. C. respectively. It will be realised that even when these metals are in the form of alloys they exert an appreciable vapour pressure. Gillett & Mack have emphasised how near the correct pouring temperature is to the actual boiling point of copper-zinc alloys, there being only a margin of 20 to 40 deg. C. between these temperatures in the range 20 to 40 per cent. zinc. It is therefore imperative to keep the pouring temperature within the limit of 20 to 40 deg. C. if zinc loss is to be curtailed.

The volatilisation of lead is not so accentuated owing to its lower vapour pressure although it does occur. The prevention of loss in the case of both these metals is important from a further standpoint, namely alteration in composition, since check analyses are not included in the routine of non-ferrous melting-shop practice owing to their costliness and the delay involved.

In the rocking-arc furnace volatilisation of zinc is considerably impeded due to the fact that the unit may be made comparatively gas tight and also as a result of the rapid melting. Since the loss of zinc by evaporation is so low, "spelter-ing" first, that is, the adding of the zinc initially, is almost invariably practised and this conveniently obviates the necessity of adding zinc to the molten alloy, thus eliminating "sputter-ing" and other discomforts. When starting with a new lining an abnormal loss of both lead and zinc is experienced which is due to a certain absorption of these metals in the pores of the refractory and no figures for metal loss should be taken until at least 8 to 10 melts have been conducted.

A discrepancy often entering into determination of metal loss is the amount of extraneous matter which is "weighed in" with the charge and may consist of dirt, oil, oxide, etc., which can often amount to 1 to 2 per cent. of the charge or even more in the case of swarf.*

* "Metals and Alloys," December, 1933.

* A figure of 10 per cent. has been encountered in personal experience.—EDITOR.

Typical metal loss figures in rocking-arc furnaces, taken on the basis of the charge weighed into the furnace and that subsequently poured into the ladle, are quoted in Table IV and are representative of actual practice.

TABLE IV.—*Metal Losses for Copper Alloys.*

	Up to 10 per cent. Zn + Pb.	10 to 20 per cent. Zn + Pb.	20 to 40 per cent. Zn + Pb.
	Per cent.	Per cent.	Per cent.
Solid charges	0.4 to 0.5	0.5 to 0.6	0.6 to 1.2
Swarf ..	0.8 to 1.0	1.0 to 1.4	1.4 to 2.0

Absorption of Gases

This subject has come into prominence of recent years mainly as a result of the valuable contributions which have been made to the solution of this problem by the investigations of the British Non-Ferrous Metals Research Association* on the effect of gases upon the unsoundness of copper- and aluminium-rich alloys. Many facts have come to light out of these and some previous researches. It has been established almost unassailably that most harmful gases from the point of view of unsoundness are hydrogen and sulphur-containing gases. Hydrogen is readily soluble in most copper-rich alloys but the solubility falls sharply at the solidification temperature. If hydrogen has come into contact with the melt and normal cooling rates are employed unsoundness will be produced in the resulting castings. If, however, cooling is extremely slow the hydrogen will be allowed to escape from the metal while still molten, and blow-holes can be minimised or prevented in this way. When oxygen is present, as is usually the case, another type of unsoundness is produced; the hydrogen still retained in the molten metal at the solidification temperature reacts with the dissolved oxide to form steam which is entrapped by the copper as it freezes

$$Cu_2O + H_2 \rightleftharpoons 2Cu + H_2O.$$

Sulphur dioxide is another soluble gas which behaves in a similar manner to hydrogen, in that it is very appreciably soluble in molten copper but only slightly so in the solid state. What is normally met with in practice is the absorption of sulphur by the metal and the simultaneous presence of oxygen which will react in the following manner:—

$$Cu_2S + Cu_2O \rightleftharpoons Cu + SO_2.$$

The sulphur dioxide liberated at the moment of freezing is entrapped to form blow-holes.

On the other hand nitrogen, carbon monoxide, and carbon dioxide (these are the other gases which normally come into contact with molten metals) cannot produce unsoundness as they are insoluble in the molten copper alloys.† In point of fact perfectly sound deoxidised copper is being cast to-day by melting and pouring in an atmosphere containing carbon monoxide and carbon dioxide as well as nitrogen.

In the case of the bronzes and the brasses it is extremely probable that the causes of unsoundness are analogous to those found in copper. Hydrogen is soluble in these alloys and probably reacts with zinc oxide at the moment of freezing to form gas cavities. The same reasoning would apply to the case of bronzes.

Gas removal methods are not practicable on an industrial scale except those involving the addition of deoxidants which minimise but do not eliminate unsoundness completely. The natural deduction from the work reviewed above seems to be to avoid melting in any atmosphere containing hydrogen or hydrogen-containing gases and also to avoid sulphur contamination. Water vapour is deleterious as it will react with the molten metal to form hydrogen which is dissolved in the metal in addition to the formation of the oxide. Nickel alloys are particularly susceptible to the action of sulphur, forming nickel sulphide which will occur in the resulting alloys as a nickel—nickel-sulphide eutectic thus causing intergranular brittleness. One solution to this problem therefore is to melt out of contact with all fuel gases, namely to adopt electric melting.

In the indirect rocking-arc furnaces the atmosphere is reducing, but normally only contains carbon monoxide and carbon dioxide which are harmless. There is no inherent source of hydrogen or sulphur, and therefore no possibility of producing the type of unsoundness mentioned above. Sometimes, however, wet and oily scrap may be charged and these will become effective in producing hydrogen and hydrocarbons in the atmosphere and should therefore be avoided if the best quality of material is to be cast.

Results of Practice

In the following paragraphs are recorded the conclusions reached after 7 years' operation of rocking-arc furnaces in the plant of a fairly large producer of non-ferrous valve castings.*

The output over this period varied from 5 to 20 tons of castings per day, the majority of which was for valves and other pressure goods requiring a dense homogeneous metal. The main composition melted was as follows:—copper, 79 per cent.; tin, 2 to 2.5; lead, 10; zinc 8.5 per cent.

It was found that by the introduction of electric melting the average quality of the material cast was considerably higher than that previously made in the crucible, whilst it offered the opportunity of materially reducing metal losses and increasing the yield of good castings. The total overall losses of metal including melting, pouring, mechanical losses, sand blasting, grinding, etc., were between 1.25 and 1.5 per cent. The actual melting loss on test was found to be under 0.5 per cent. In comparison overall losses in previous crucible practice sometimes reached 10 per cent. but could not be reduced much below 3 to 4 per cent. with skilful operation. This company is actually showing a saving of 28s. per ton on metal losses alone as compared with their previous crucible methods.

Approximately 63 per cent. of the material melted represents good castings. Cleaning-room scrap has been reduced from 4.4 to 1.4 per cent., whilst shop scrap fell from 3.8 per cent. to 1.3 per cent. The figure for total scrap which was 8.24 per cent. in 1926 has now reached 2.7 per cent. of the total melt. The overall loss of castings on hydraulic test is below 1 per cent.

The ability to utilise light scrap directly has shown economies in the cost of raw materials and a proportion of borings, turnings, etc., is included in the charge which averages as follows:—

	Per cent.
Foundry returns	37
Borings and light scrap	18
Ingot made from electric furnace metal ..	27
New metals	18
Total	100

It is emphasised that the pouring temperature can be accurately controlled on the kilowatt-hour meter to within plus or minus 20 deg. Fah.

Melting of Nickel Alloys

Several nickel alloys are being melted for foundry work in this type of furnace, amongst which are the nickel brasses (commonly termed nickel silvers), Monel metal, and certain Ni-Cr-Fe alloys for heat-resisting purposes. There is practically no pick-up of carbon and the atmosphere is sulphur free—two important features which make the furnace eminently suited to this work. The melting time for nickel alloys is from 35 to 45 min. depending on the casting temperature. The power consumption will, of course, vary with the particular alloy being made. Fig. 5 is a record sheet giving some operating data on a 200- to 250-lb. furnace casting nickel alloys.

Operating Costs

Having examined the metallurgical conditions obtaining in electric-foundry practice it will be necessary to consider, before concluding, the economies of electric melting, upon which its applicability or otherwise will depend. Melting costs will vary widely with operating conditions and those which are to be quoted in the following must be adjusted to particular requirements.

The electric furnace as a rule has a rather higher fuel (or electricity) bill, excepting in certain cases the pit-fired crucible, but this is only a single factor among the several items constituting the operating costs and is often outweighed by other savings. If the overall costs are approximately equal in two instances it would be preferable to install the electric furnace owing to certainty of attaining consistently a higher standard of quality as well as other intangible benefits.

Some figures set out in Table V are quoted below which are intended to be fairly representative of pit fire, reverberatory, and electric furnace practice for a common red-brass foundry mixture namely 85/5/5/5.

TABLE V.—*Operating Costs of Various Types of Furnaces* *

	£ s. d.
Electric rocking-arc furnace (700 lbs. per hr.)—	
Electricity, 310 units at 0.5d. ..	12 11
Labour (1 man at 1s. 4d. per hr.) ..	5 0
Lining	1 9
Electrodes, 4 lbs. at 10d.	3 4
Maintenance and repairs	1 3
Metal loss, 0.5 per cent. at 5½d. per lb.	5 2
Melting cost per ton	£1 9 5
Reverberatory furnace.	
Fuel	7 0
Labour	7 0
Lining and maintenance	5 6
Metal loss, 1.6 per cent.	16 6
Melting cost per ton	£1 16 0
Crucible (pit fire).	
Fuel	10 0
Labour	1 0 0
Crucibles	7 0
Repairs and maintenance	1 0
Metal loss, 1.2 per cent.	10 6
Melting cost per ton	£2 8 6

The metal loss figures in the case of the fuel-fired furnaces are considered conservative. It will be noted that the electric furnace shows a saving over the cheapest fuel-fired furnace and in many cases this saving is sufficient to repay the initial outlay on plant in between a year and two years.

Conclusion

An endeavour has been made to review electric non-ferrous foundry practice both in regard to the metallurgical and economic aspects. An omission has been made with respect to the aluminium foundry in which there is a growing demand for electric melting but in this case the resistor-heated furnace is a more suitable appliance. A consideration of the subject was too lengthy for inclusion in this article.

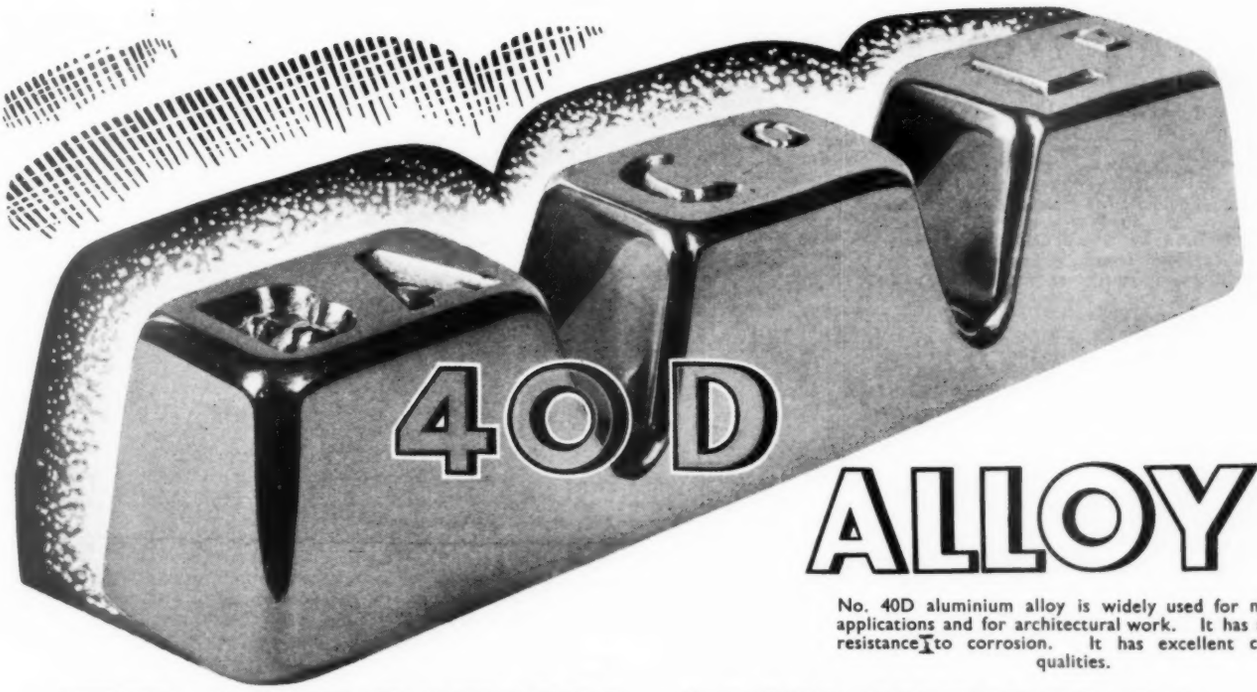
The undoubted revival in the brass and bronze foundry which has followed the period of decreased activity will probably induce the producer of castings to look to the modernisation of his equipment and in this connection the electric furnace should fill an important rôle.

* See Prytherch, Allen and Daniels, "J. Inst. Met.," 1930, Vol. 43, No. 1.

† See N. P. Allen, *loc. cit.*; A. G. Lobley and D. Jepson, "J. Inst. Metals," 1926, Vol. 35.

* H. M. St. John, "Electric Melting News," December, 1934, and January, 1935.

* These figures carry no depreciation allowances—EDITOR.



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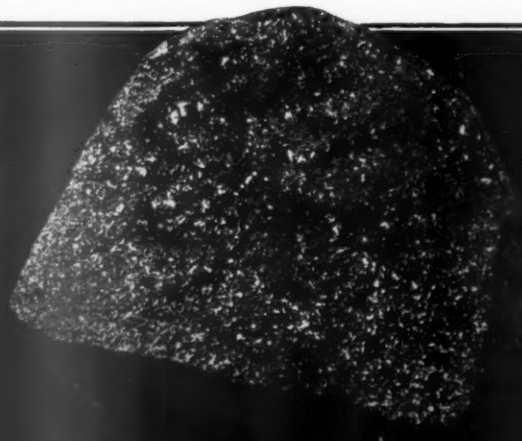

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PIG IRON

This Week's News in Brief

Trade Talk

THE NORTH BRITISH LOCOMOTIVE COMPANY, LIMITED, Springburn, Glasgow, has received an order from the San Paulo Railway, Brazil, for two locomotives.

KIRKCALDY DEAN OF GUILD COURT has granted warrant to Mr. John Leitch, Willowbank Foundry, Katherine Street, to carry out additions to the property.

DUNCAN STEWART & COMPANY, LIMITED, Glasgow, have received an order for a large evaporator for a South African sugar factory. This will give employment to 200 men for six months.

IN ORDER to be able to deal with a heavy demand for the small-sized spun-iron pipes needed in connection with housing schemes and for other purposes, the Staveley Coal & Iron Company, Limited, Derbyshire, propose to make considerable additions to their foundry equipment.

THE CUNARD WHITE STAR liner "Olympic" has been purchased by Sir John Jarvis and resold to Messrs. Thos. W. Ward, Limited, of Sheffield, for breaking up at Jarrow. The vessel will be broken up at Palmers' yard, Jarrow. The price paid for the vessel is stated to be £100,000.

COMMANDER SIR CHARLES CRAVEN, President of the Tyneside Industrial Development Board, announces that Vickers-Armstrong's Elswick (Newcastle) works now employ 5,500 people, against 3,800 two years ago, and that at the Walker (Newcastle) Naval Yard 1,000 are now employed, although the yard was closed two years ago.

THROUGH THE BREAKING of steering gear, a heavy motor-lorry proceeding from Glasgow to Tendall & Sons, iron merchants, Fraserburgh, and loaded with 40 baths, went over a bank near Fraserburgh and struck a wall. The driver and his assistant escaped injury, but all 40 baths except four were smashed to pieces. They were intended for Fraserburgh slum-clearance housing scheme.

THE NATIONAL SHIPBUILDING SECURITIES, LIMITED, of which Sir James Lithgow is chairman, have, it is understood, made a definite offer to acquire the Meadowside shipyard, engineering and boiler workshops and docks at Partick, Glasgow. The offer will be considered by the liquidators and creditors with other tenders. The latter include an offer by a firm which is prepared to continue the business as at present.

THE MANGANESE-ORE MINE at Urkut, Hungary, **which has the largest deposits of manganese ore in Europe with the exception of the Russian mines in the Ural, is to be brought into full operation after having been idle for three years. The whole production is to be disposed of in the German market, as a result of arrangements made by the Deutsche Bank, which holds the majority of the shares in the Hungarian undertaking.**

IT IS EXPECTED that work will soon be begun at the iron and steel works at Penistone, Yorks, which have been closed for five years. Messrs. David Brown & Sons (Huddersfield), gear manufacturers, have been in negotiation for the purchase of the site of 27 acres, but there were difficulties in the way of a final settlement. These have been removed, and provisional possession has been given to Messrs. Brown so that they can proceed with their work.

THE HALF-YEARLY REPORT of the Ironfounding Workers' Association states that trade during the half-year has been all that could be expected, and the improvement at the end of 1934 has not only been maintained, but has advanced materially. Therefore, many unemployed moulders have been in the happy position of again getting back to work. There are no doubts regarding the future, as the indications are that trade in the light-castings industry is undoubtedly likely to continue good for some considerable time.

IN VIEW OF THE MEETING of the National Smoke Abatement Society at Bristol this week, it is interesting to note that the Coal Utilisation Council has set aside some thousands of pounds to finance research into methods of eliminating smoke from the domestic grate. This research, which has already begun, is being carried out in collaboration with the Government Fuel Research Station, and a number of devices for reducing or preventing the smoke from bituminous coal burnt in domestic appliances have been submitted for consideration.

APPLICATIONS RECEIVED by the Railway Rates Tribunal for the approval of agreed charges under the provisions of Section 37 of the Road and Rail Traffic Act, 1933, include one by Messrs. Thos. Marshall & Son, Limited, Wellington Bridge, Leeds, and the L. & N.E. and L.M. & S. Railway Companies, in connection with the carriage of iron or steel cisterns, cylinders, dustbins, incinerators, moulders' boxes, tanks, tubs, weather bars and wringer stands. Another application, by British Steam Specialities, Limited, Fleet Street, Leicester, and the L. & N.E. and L.M. & S. Railway Companies, relates to machinery parts, such as valves, gauges, pumps and lubricators, also fittings and tools.

Personal

MR. S. G. SMITH, the well-known foundry consultant, has changed his address to 131, Hythe Road, Willesborough, Ashford, Kent.

MR. F. S. LESLIE, of the staff of Douglas Fraser & Sons, Limited, Westburn Foundry, Arbroath, has been presented with a leather suitcase on the occasion of his leaving the firm to take up another appointment.

MR. R. B. HODGSON is resigning his position as managing director of the Whessoe Foundry & Engineering Company, Limited, Darlington, as at the end of this month. He will be succeeded by Mr. C. M. Spielman, who has been an active director of the company for twelve years. Mr. Hodgson will remain a member of the board.

MR. W. PYATT, of Leicester, who for some years has represented J. Grayson Lowood & Company, Limited, of Deepcar, near Sheffield, has now entered the service of General Refractories, Limited. This is as a result of the recent merger between the two companies, in consequence of which General Refractories, Limited, has taken over the sales of certain of the Lowood products. Mr. Pyatt will be attached to the London staff of General Refractories, Limited, and will act as one of their representatives in the London area and western counties.

Obituary

WE REGRET TO ANNOUNCE the death of Mr. B. H. Johnson, Vice-President of the American Foundrymen's Association, and assistant to the President, R. D. Wood Company, Philadelphia, on August 27, in Toronto. In addition to serving as Vice-President of the American Foundrymen's Association, Mr. Johnson was a member of several committees of the Grey Iron Division of that organisation. He had been a director of the Association, and the representative of the Grey Iron Institute on the Joint Committee on Foundry Education in Engineering Schools. Mr. Johnson was one of the organisers of the Grey Iron Institute (Cleveland), and was active in the work of that association, serving as President for one year. He was also an active member of the Philadelphia Foundrymen's Association, now the Metropolitan Philadelphia Chapter of the American Foundrymen's Association, in the formation of which Mr. Johnson was active, and the Metal Manufacturers' Association of Philadelphia. Mr. Johnson visited Great Britain on several occasions.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

Priorfields Foundry Company, Limited, Sheldons Foundry, Ettingshall, Staffs. — Capital £4,000. Directors: J. Norton and Mrs. M. Norton.

High Duty Bronze, Limited. — Nominal capital £10,000 in £1 shares. Directors: W. C. Devereux, "Meads," Stoke Park, Bucks; D. McKellar and G. Skript.

G. & R. Thomas, Limited, Hatherton Furnaces, Bloxwich, Staffs.—Capital £10,000 in £1 shares. To enter into an agreement for the acquisition of the business carried on by G. & R. Thomas, Limited (in liquidation); to manufacture iron and produce coke. Directors: A. J. While and C. G. While.

Foundry Selling Practice

(Concluded from page 212.)

not promptly assure his customers that everything will be all right now *he* has taken over the territory. Let him, if he feels inclined, say that *his firm* have recognised that their methods have not always been of the wisest, and wish him to carry out a new policy on which they have embarked. But if he is well advised, he will not deny human fallibility, in the past and in the future, but will indicate his wish to minimise it by his own personal efforts as much as possible.

Classification of Prospects

As he goes over the area for the first time, the new man should carefully grade the names on his sales lists. A good plan is to use the simple letters A, B, C, and onwards. A, for example, may signify a first-class firm, which should invariably be called upon when he is in its neighbourhood. B may represent a firm that should be called upon as opportunity offers, and subject to all the A firms in its neighbourhood being visited. C may represent smaller firms, not worth calling upon more than once or twice a year. And so on, down to the firms that can be dismissed as worthless. It must be clearly borne in mind that these classifications are merely a guide, and not a rigid specification. At any given moment, a firm in the C class may, for one reason or another, leap into the A class, and the wise representative never ignores these possibilities. The first thought should be to check and confirm or modify these first rough generalisations as a result of later visits. Grading of this kind enables the representative to cover his new territory with maximum speed and convenience, and also helps him to derive the maximum profit and business.

Above all things, the new representative must remember that, so far as his prospective and actual customers are concerned, he is very much on trial. They have nothing that ties them to him in advance. A false start may take him many months to recover. He should, therefore, conduct himself with courtesy and simplicity, striving to create that good first impression which will make all the difference to his second round and those that follow it. On his first trip, most people will see him, if only out of curiosity. They will wish to see for themselves what sort of man Blank & Company have sent out to replace "Old Thingumbob," but if they do not like that first view of him, he will not find nearly so ready a reception next time.

Contracts Open

Haltwhistle, September 25.—2,000 lineal yds. of 15-, 12- and 9-in. cast-iron pipe sewers, for the Rural District Council. Mr. C. Franklin Murphy, Lloyds Bank Chambers, Morpeth. (Fee £5, returnable.)

Newport (I.W.), September 23.—Electrically-driven centrifugal sewage pumps, for the Town Council. Messrs. Sandford Fawcett & Partners, 53, Victoria Street, Westminster, S.W.1. (Fee £3 3s., returnable.)

Kidderminster, October 2.—Ten miles of 3-in. and 4-in. cast-iron pipe water mains, for the Kidderminster Rural District Council. Messrs. Fiddian & Deeley, 13, Church Street, Stourbridge. (Fee £3 3s., returnable.)

Cheadle, September 25.—1,360 yds. of 3-in. c.i. water main, with valves, hydrants, etc., for the Cheadle Rural District Council. Mr. A. P. Hancock, surveyor, Council Offices, Cheadle. (Fee £1 1s., returnable.)

Teheran, October 15.—Railway plant, consisting of locomotive and wagon turntables, weighbridges, swing gates, water cranes, pumps, etc., for the Kampsax Consortium. The Department of Overseas Trade. (Reference T.Y. 5,245.)

Porthcawl, September 30.—300 yds. of 9-in. cast-iron pumping main, and a pumping station and a pump chamber, for the Urban District Council. Messrs. J. Taylor & Sons, Caxton House, Westminster, S.W.1. (Fee £5, returnable.)

XUM

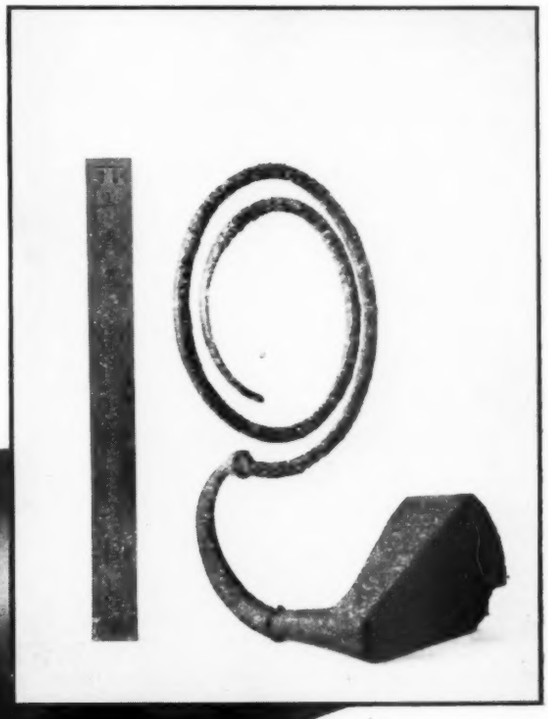
Light Castings need a *Fluid* Iron!

A free-running fluid iron is essential to produce clean, sharply-moulded light castings such as Rainwater pipes, Drain pipes, Builders' Hardware, Baths, Stoves, Gas and Electric Fires, etc. The relatively high phosphorus content of Rixon's (W'bro'.) No. 3 Foundry Iron ensures the necessary fluidity for this class of work.

Rixon's (W'bro'.) Irons are produced in two modern furnaces solely for the open market.

Fluidity Test

The illustration shows a typical spiral cast with a mixture containing Rixon's Iron. The feed to the spiral was only $\frac{3}{8}$-in. diameter.



ANALYSIS

	Per Cent
Silicon	3.29
Sulphur	0.025
Phosphorus	1.65
Manganese	0.34
Graphitic Carbon	3.52
Combined Carbon	0.12
Total Carbon	3.64

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM

The largest producers of Pig Iron (for Sale) in Great Britain

RIXON'S (W'BRO') No. 3 Foundry Iron

XUM

Raw Material Markets

Most of the works are well employed, and the prospects for the remaining months of the year are regarded as satisfactory. The demand for pig-iron has declined on account of the recent heavy buying, consumers being fully covered for several months. Semi-finished steel is in heavy demand, and this is intensified by the temporary absence of foreign supplies.

Pig-Iron

MIDDLESBROUGH.—The position of the Cleveland iron trade continues to be very favourable, and the future is regarded with confidence. Heavy bookings over the next two or three months have been reported, and the output of the blast furnaces producing Cleveland foundry iron is being taken up steadily. The satisfactory home consumption compensates for the very restricted export trade. Prices have now been stabilised on a profit-earning basis. Quotations for No. 3 Cleveland G.M.B. foundry grade are 67s. 6d. in the Middlesbrough area, 69s. 6d. elsewhere on the North-East Coast, 67s. 3d. in Falkirk, and 70s. 3d. in Glasgow. No. 1 foundry iron is quoted at 2s. 6d per ton extra, and a discount of 1s. per ton is allowed on No. 4 foundry and No. 4 forge.

Local steelworks continue to take up a large proportion of the output of hematite, and there is a good demand for any that is left. The export trade remains a weak feature, but some material has recently been sent to Denmark, South Africa and the Far East. Prices are firm, and no manufacturer will accept less than the specified minimum scale, which is based on No. East Coast hematite at 71s. per ton delivered Middlesbrough.

LANCASHIRE.—Pig-iron consumption in this area is at a high level, Midland common irons being in particularly good call. Hematite also has a satisfactory following, although business in this direction is not too brisk. The light-castings branch of the trade continues to have excellent requirements. Machine-tool makers and heavy electrical firms are taking up large tonnages of pig-iron, and an improved demand from the jobbing section has been received. Staffordshire, Derbyshire and Lancashire brands of No. 3 iron equal to Derbyshire are all on offer for delivery in the Lancashire zone on the basis of 74s. per ton, Northamptonshire at 72s. 6d., and Scottish No. 3 at about 81s. 6d. The hematite position remains very strong on the basis of from 80s. to 81s. per ton, delivered equal to Manchester, for East Coast material, and around 81s. for West Coast.

MIDLANDS.—An expansion in the demand for pig-iron is expected in the near future, although the position at the present time is quite satisfactory. Prices are unchanged, and the minimum figures delivered to Birmingham and Black Country stations are 67s. 6d. per ton for Northants No. 3 and 71s. for Derbyshire, Lincolnshire and North Staffordshire No. 3, these prices being subject to a small sliding-scale rebate to large consumers. The general engineering trade is still consuming fair tonnages of special brands of iron, and prices are as follow:—Special refined iron, £5 7s. 6d. to £7, low-phosphorus pig from 85s. to 90s., and medium phosphorus from 72s. to 82s. 6d. per ton, delivered South Staffordshire works. Very little new business has been transacted in hematite iron recently owing to consumers being fully covered. Controlled prices, delivered this district, are 84s. 6d. per ton for West Coast mixed numbers, 84s. for East Coast No. 3, and 83s. for Welsh mixed numbers.

SCOTLAND.—Consumption of pig-iron remains satisfactory, and there is no alteration to report in the state of the market. The unchanged minimum prices are 70s. for No. 3 foundry f.o.t. furnaces, with 2s. 6d. extra for No. 1. The light-castings founders are still taking up a good tonnage of pig-iron, and prospects are favourable. Cleveland iron prices are unchanged at 67s. 3d. f.o.t. Falkirk and 70s. 3d. f.o.t. Glasgow for No. 3 foundry, and other English foundry is 1s. 3d. per ton less than these quotations. Local steelworks are requiring satisfactory quantities of pig-iron, and the malleable works are much better employed than they have been recently. Prices of steelmaking iron are:—Mixed numbers Scottish hematite, 71s. to 73s. 6d.; mixed numbers West Coast hematite, 75s.; ordinary mixed numbers East Coast hematite, 77s. 6d.; basic, British and Indian, 70s. (less 5s. rebate).

Coke

The coke market is now very much brighter than it has been for some time. The improvement in consumption, noted recently, is maintained, and a fair volume of orders has been booked during the past two weeks. For delivery in Birmingham and district, best Durham coke is on offer at from 37s 6d. to 40s.; Welsh, according to analysis, at from 31s. 6d. to 43s. 6d., and Scottish low-ash coke at 39s. to 41s.

Steel

Business in the steel trade appears to be developing upon normal lines, with the promise of considerable activity in the last quarter of the year. In the semi-finished steel section the situation is satisfactory. The works are fully employed and there appears to be a steady expansion in consumers' requirements. The quantities of Continental material now reaching this country have little effect upon the demand, and the home works are assured of busy conditions for some months. The volume of business in finished-steel materials fluctuates somewhat; but the tendency is for the market to gather strength. The manufacturers of structural material are in a good position as regards the tonnage of orders on their books, and substantial quantities of steel are being called for by the shipbuilding and engineering trades.

Scrap

On the Cleveland market steelworks are able to cover all their immediate requirements in heavy melting steel at 52s. 6d. per ton. Cast-iron scrap is firm at 52s. 6d., and is in demand by foundrymen. Clean light cast iron is offered at 42s. 6d. per ton, and heavy steel turnings and cast-iron borings are being called for at 37s. 6d. and 27s. 6d. per ton respectively. In the South Wales area the steelworks are better employed and are taking up fair quantities. Heavy mild-steel scrap in furnace sizes is in better demand at 56s., but bundled steel scrap is quiet at 52s. to 54s. per ton. A good market exists for light cast-iron scrap, which, in small quantities, realises 42s. 6d. to 45s. The Birmingham market reports increased activity. Heavy steel scrap in furnace sizes is at 42s. 6d. to 43s. 6d. f.o.r., and mixed heavy iron and steel is at 41s. 6d. f.o.r. Compressed new-production steel shearings are at 42s. 6d., and are in good demand, while heavy machinery metal in handy sizes is at 55s. Good heavy machinery metal is at 50s. Short heavy steel scrap, as used in the foundries, is at 55s. per ton. Heavy steel scrap is in good demand on the Scottish market, and consumption is maintained at a high level. Good machinery cast-iron scrap, in pieces not exceeding 1 cwt., is changing hands at 56s. 6d. to 57s. 6d., while for ordinary cast iron to the same specification, about 5s. less is quoted, and for steelworks cast iron in furnace sizes 50s., with light cast iron at 45s., all delivered f.o.t. consumers' works.

Metals

Copper.—This market has shown a somewhat firmer tendency this week, but the international situation still has an unsettling effect on it, as is the case with other metals. Italy has again entered the market, and several inquiries have been forthcoming from that country. The world smelter output in 1934 was 1,273,200 metric tons, which represents an increase of 237,000 tons on the previous year. According to the Metallgesellschaft, the output of Great Britain in 1934 was 11,500 metric tons, compared with 12,000 tons in 1933.

Daily market prices:—

Cash.—Thursday, £33 13s. 9d. to £33 15s.; Friday, £34 2s. 6d. to £34 3s. 9d.; Monday, £34 7s. 6d. to £34 10s.; Tuesday, £34 12s. 6d. to £34 13s. 9d.; Wednesday, £34 10s. to £34 11s. 3d.

Three Months.—Thursday, £34 1s. 3d. to £34 3s. 9d.; Friday, £34 11s. 3d. to £34 12s. 6d.; Monday, £34 17s. 6d. to £34 18s. 9d.; Tuesday, £35 1s. 3d. to £35 2s. 6d.; Wednesday, £34 18s. 9d. to £35 2s. 6d.

Tin.—The result of the meeting of the International Tin Committee, held in Brussels, has been announced, and contains no surprise decisions. It was generally expected that the quotas would remain at 65 per cent. of "standard," although it was rumoured that a further increase in quotas by 5 per cent. might have been made. The Committee came to no conclusion regarding the renewal of the restriction scheme after the end of 1936.

The production of tin in ore in Great Britain was 145 tons in July, compared with 142 tons in the previous month. Malaya produced 5,348 tons in July, and the Dutch East Indies 1,804 tons.

Day-to-day fluctuations:—

Cash.—Thursday, £221 15s. to £222; Friday, £222 to £222 10s.; Monday, £225 5s. to £226; Tuesday, £226 to £226 5s.; Wednesday, £226 17s. 6d. to £227 2s. 6d.

Three Months.—Thursday, £210 5s. to £210 15s.; Friday, £212 10s. to £212 15s.; Monday, £214 10s. to £214 15s.; Tuesday, £214 to £214 10s.; Wednesday, £214 to £214 10s.

Spelter.—Trade demand for this metal has been fairly good recently, but there are very few new features to be noted. The Metallgesellschaft gives the world's smelter output of zinc in July as 110,392 metric tons, as compared with a total of 106,321 metric tons in the previous month.

Official quotations were as follow:—

Ordinary.—Thursday, £15 5s.; Friday, £15 5s.; Monday, £15 5s.; Tuesday, £15 5s.; Wednesday, £15 10s.

Lead.—A more confident tone has entered this market, and business has increased. Consumption has been more than maintained and is rising rapidly. Figures published by the American Bureau of Metal Statistics give the world consumption of lead as 89,420 metric tons per month, which represents the average for the last three months, and excludes the consumption in the United States. Individual figures show that Great Britain consumed 27,564 metric tons, Germany 13,859 tons, and France 9,409 tons.

Day-to-day quotations:—

Soft Foreign (Prompt).—Thursday, £15 18s. 9d.; Friday, £16 1s. 3d.; Monday, £16 2s. 6d.; Tuesday, £16 7s. 6d.; Wednesday, £16 10s.

Iron and Steel Output in August

The British Iron and Steel Federation reports that there were 98 furnaces in blast at the end of August, the same number as at the beginning of the month. The production of pig-iron in August amounted to 543,400 tons, compared with 547,300 tons in July and 503,300 tons in August, 1934. The month's production includes 128,200 tons of hematite, 267,500 tons of basic, 122,200 tons of foundry and 13,700 tons of forge pig-iron. The production of steel ingots and castings amounted to 759,900 tons in August, compared with 803,300 tons in July and 667,000 tons in August, 1934. The decline was due to the August holidays.

Firing Furnaces with Pulverised Fuel

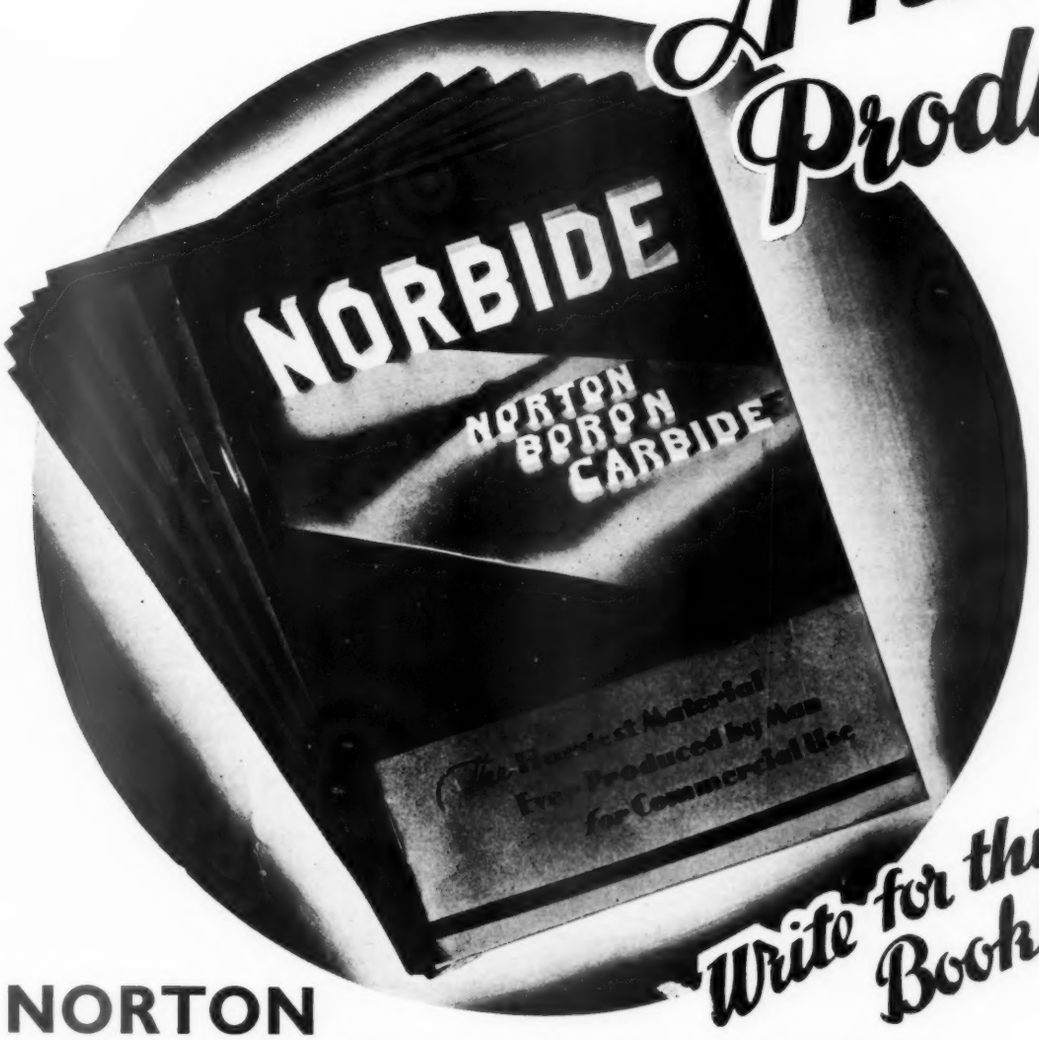
(*Concluded from page* 208.)

expectations, a scheme has been formulated for the conversion of the other two furnaces. Connections from the existing receiver have been made to the oil-fired furnace, and it remains merely to fit the burners. The plant as a whole, however, will be entirely rearranged, as it is intended to adopt a central system rather than the unit principle.

The pulverising plant—a second unit is to be installed, though for the most part it may act in the nature of standby—will be installed on the opposite side of the shop rail track to the furnaces, so that the fuel may be discharged from the trucks into a below-ground hopper, from which the pulverisers will be fed by a small elevator. A second receiver will be essential, and this will be placed as near the consuming point as convenient. At the same time, a ring-pipe system will make the receivers common to either or both of the pulverising units.

XUM

A New Product



Write for this Booklet!

NORTON

NORBIDE SAND BLAST NOZZLES

LINED WITH THIS NEW MATERIAL ARE GUARANTEED FOR 1,500 HRS. USING STEEL GRIT OR SHOT AT 90 LBS. PRESSURE. (During that time the wear at the outlet end will not exceed 50% of the original diameter.)

MODERNISE your Equipment by using these Nozzles and obtain:—

INCREASED NOZZLE LIFE • DECREASED AIR CONSUMPTION
IMPROVED STREAM CONTOUR AND VELOCITY

Distributors for NORTON NORBIDE SAND BLAST NOZZLES
HARRISON BROS. (ENG.) LTD
MIDDLESBROUGH

NORTON GRINDING WHEEL Co., Ltd.
Welwyn Garden City,
HERTFORDSHIRE

RAW MATERIALS—PRICE LIST

(Wednesday, September 18, 1935)

COPPER

	£	s.	d.
Standard cash	34	10	0
Three months	34	18	9
Electrolytic	38	5	0
Tough	37	0	0
Best selected	37	10	0
Sheets	66	0	0
India	49	0	0
Wire bars	39	0	0
Ingot bars	39	0	0
H.C. wire rods	42	10	0
Off. av. cash, August	32	13	6⅝
Do., 3 mths., August	33	1	0⅝
Do., Sttlmnt., August	32	13	5⅞
Do., Electro, August	36	5	0
Do., B.S., August	35	10	10
Do., wire bars, August	36	10	5⅝
Solid drawn tubes			10d.
Brazed tubes			10d.
Wire			6d.

BRASS

Solid drawn tubes	9¼d.
Brazed tubes	11¼d.
Rods, drawn	8d.
Rods, extd. or rlld.	4¼d.
Sheets to 10 w.g.	7⅝d.
Wire	7¼d.
Rolled metal	7¼d.
Yellow metal rods	4¼d
Do. 4 × 4 Squares	5⅜d.
Do. 4 × 3 Sheets	5¼d

TIN

	£	s.	d.
Standard cash	226	17	6
Three months	214	0	0
English	227	0	0
Bars	228	0	0
Straits (nom.)	228	17	6
Australian (nom.)	227	7	6
Eastern	222	0	0
Banca (nom.)	228	17	6
Off. av. cash, August	223	4	8⅜
Do., 3 mths., August	212	19	8⅜
Do., Sttlmt., August	223	4	3⅞

SPELTER

	£	s.	d.
Ordinary	15	10	0
Remelted	16	5	0
Hard	13	0	0
Electro 99.9	18	2	6
English	16	10	0
India	13	15	0
Zinc dust	19	10	0
Zinc ashes	3	5	0
Off. aver., August	14	16	6 3/16
Aver. spot, August	14	14	3⅞

LEAD

	£	s.	d.
Soft foreign ppt.	16	10	0
Empire (nom.)	17	2	6
English	18	10	0
Off. average, August	15	15	7½
Average spot, August	15	15	5½

ALUMINIUM

Ingots	£100 to £105
Wire	1/1 to 1/9 lb.
Sheet and foil	1/2 to 2/9 lb.

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	24	0	0
Do., V.M. ex-whse.	25	0	0
Rods	29	0	0

ANTIMONY

	£	s.	d.	to	£	s.	d.
English	71	0	0	to	72	0	0
Chinese, ex-whse.					68	0	0
Crude, c.i.f.					28	10	0

QUICKSILVER

	£	s.	d.	to	£	s.	d.
Quicksilver	11	0	0	to	11	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS

Ferro-silicon—	
25%	£8 17 6
45/50%	£12 15 0
75%	£17 17 6
Ferro-vanadium—	
35/50%	12/8 lb. Va.
Ferro-molybdenum—	
70/75% carbon-free	4/6 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£17 0 0
Ferro-tungsten—	
80/85%	3/- lb.
Tungsten metal powder—	
98/99%	3/3 lb.
Ferro-chrome—	
2/4% car.	£33 0 0
4/6% car.	£21 15 0
6/8% car.	£21 0 0
8/10% car.	£21 0 0
Ferro-chrome—	
Max. 2% car.	£34 0 0
Max. 1% car.	£36 5 0
Max. 0.70% car.	£37 5 0
70% carbon-free	9½d. lb.
Nickel—99.5/100%	£200 to £205
"F" nickel shot	£184 0 0
Ferro-cobalt, 98/99%	5/6 lb.
Metallic chromium—	
96/98%	2/5 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0 to 11 5 0
76/80% packed	£11 15 0 to 12 5 0
76/80% export	(nom.) £9 15 0
Metallic manganese—	
94/96% carbon-free	1/3 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL

Finished bars, 14% tungsten	2s. 0d.
Finished bars, 18% tungsten	2s. 9d.

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to 7/16 in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ½ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP

South Wales—	£	s.	d.	to	£	s.	d.
Heavy steel					2	16	0
Bundled shrngs.	2	7	6	to	2	16	0
Mixed iron and steel	2	10	0	to	2	12	0
Heavy cast iron	2	11	0	to	2	13	0
Good machinery	2	12	6	to	2	15	0
Cleveland—							
Heavy steel					2	12	6
Steel turnings					1	17	6
Cast-iron borings					1	7	6
Heavy cast iron					2	12	6
Heavy machinery	2	14	0	to	2	15	0
Midlands—							
Light cast-iron scrap					2	7	6
Heavy wrought iron					2	17	6
Steel turnings					1	14	0
Scotland—							
Heavy steel					2	10	0
Ordinary cast iron	2	11	6	to	2	12	6
Engineers' turnings					2	0	0
Cast-iron borings	1	17	6	to	1	19	0
Wrot-iron piling					2	17	6
Heavy machinery					2	16	6

London—Merchants' buying prices, delivered yard.

	£	s.	d.
Copper (clean)	27	0	0
Brass	18	0	0
Lead (less usual draft)	13	10	0
Tea lead	10	0	0
Zinc	9	10	0
New aluminium cuttings	69	0	0
Braziery copper	23	0	0
Gunmetal	25	0	0
Hollow pewter	150	0	0
Shaped black pewter	116	0	0

PIG-IRON

N.E. Coast (d/d Tees-side area)—	
Foundry No. 1	70/-
Foundry No. 3	67/6
,, at Falkirk	67/3
,, at Glasgow	70/3
Foundry No. 4	66/6
Forge No. 4	66/6
Hematite No. 1	71/-
Hematite M/Nos.	70/6
N.W. Coast—	
Hem. M/Nos. d/d Glas.	75/-
,, d/d Birm.	84/6
Malleable iron d/d Birm.	115/-
Midlands (d/d Birmingham dist.)—	
Staffs No. 4 forge	67/-
,, No. 3 fdry.	71/-
Northants forge	63/6
,, fdry. No. 3	67/6
,, fdry. No. 1	70/6
Derbyshire forge	67/-
,, fdry. No. 3	71/-
,, fdry. No. 1	74/-
Scotland—	
Foundry No. 1, f.o.t.	72/6
,, No. 3, f.o.t.	70/-
Hem. M/Nos. d/d	71/- to 73/6
Sheffield (d/d district)—	
Derby forge	64/6
,, fdry. No. 3	68/6
Lincs forge	64/6
,, fdry. No. 3	68/6
W.C. hematite	86/-
Lancashire (d/d eq. Man.)—	
Derby fdry. No. 3	74/-
Staffs fdry. No. 3	74/-
Northants fdry. No. 3	72/6
Cleveland fdry. No. 3	74/-
Dalzell. No. 3 (special)	102/6 to 105/-
Glengarnock, No. 3	81/6
Clyde, No. 3	81/6
Monkland, No. 3	81/6
Summerlee, No. 3	81/6
Eglinton, No. 3	81/6
Gartsherrie, No. 3	81/6
Shotts, No. 3	81/6

FINISHED IRON AND STEEL

Usual district deliveries for iron; delivered consumer's station for steel.

Iron—	£	s.	d.	to	£	s.	d.
Bars (cr.)	9	12	6	to	9	15	0
Nut and bolt iron	7	10	0	to	8	0	0
Hoops	10	10	0	and up.			
Marked bars (Staffs) f.o.t.			12	0	0		
Gas strip	10	10	0	and up.			
Bolts and nuts, ¾ in. × 4 in.	15	0	0	and up.			
Steel—							
Plates, ship, etc.	8	15	0	to	8	17	6
Boiler plts.	9	5	0	to	9	7	6
Chequer plts.			10	7	6		
Angles			8	7	6		
Tees			9	7	6		
Joists			8	15	0		
Rounds and squares, 3 in. to 5½ in.			9	7	6		
Rounds under 3 in. to ⅜ in. (Untested)			8	12	0		
Flats—8 in. wide and over			8	12	6		
,, under 8 in. and over 5 in.			8	17	6		
Rails, heavy	8	5	0	to	8	10	0
Fishplates	12	5	0	to	12	10	0
Hoops (Staffs)			9	7	0		
Black sheets, 24g. (4-t. lots)			11	0	0		
Galv. cor. shts. (,,)			13	0	0		
Galv. flat shts. (,,)			13	10	0		
Galv. fencing wire, 8g. plain			14	10	0		
Billets, soft	5	10	0	and up.			
Billets, hard	6	17	6	to	7	2	6
Sheet bars	5	5	0	to	5	10	0
Tin bars	5	5	0	to	5	10	0

PHOSPHOR BRONZE

	Per lb. basis.
Strip	10½d.
Sheet to 10 w.g.	11½d.
Wire	12d.
Rods	11d.
Tubes	13½d.
Castings	12d.

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	7d. to 1/1
Rolled—	
To 9 in. wide	1/1 to 1/7
To 12 in. wide	1/1½ to 1/7½
To 15 in. wide	1/1½ to 1/7½
To 18 in. wide	1/2 to 1/8
To 21 in wide	1/2½ to 1/8½
To 25 in. wide	1/3 to 1/9
Ingots for spoons and forks	7d. to 1/3½
Ingots rolled to spoon size	10d. to 1/6½
Wire round—	
to 10g.	1/4½ to 1/11½

with extras according to gauge.
Special 5ths quality turning rods in straight lengths, 1/3½ upwards.

AMERICAN IRON AND STEEL

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	20.31
No. 2 foundry, Valley	18.50
No. 2 foundry, Birm.	14.50
Basic, Valley	18.00
Malleable, Valley	18.50
Grey forge, Valley	18.00
Ferro-mang. 80%, seaboard	85.00
O.-h. rails, h'y, at mill	36.37½
Billets	27.00
Sheet bars	28.00
Wire rods	38.00
	Cents.
Iron bars, Chicago	1.85
Steel bars	1.80
Tank plates	1.80
Beams, etc.	1.80
Skelp, grooved steel	1.70
Steel hoops	2.10
Sheets, black, No. 24	2.40
Sheets, galv., No. 24	3.10
Wire nails	2.40
Plain wire	2.30
Barbed wire, galv.	2.80
Tinplates, 100-lb. box	$5.25

COKE (at ovens)

Welsh foundry	25/- to 30/-
,, furnace	19/- to 20/-
Durham foundry	20/- to 21/-
,, furnace	16/6 to 17/9
Scotland, foundry	28/-
,, furnace	25/-

TINPLATES

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 per box	18/2 and up.
,,	28×20 ,,	36/4 and up.
,,	20×10 ,,	26/- to 26/3
,,	18¾×14 ,,	18/9 to 19/-
C.W.	20×14 ,,	15/6
,,	28×20 ,,	32/6
,,	20×10 ,,	22/9
,,	18¾×14 ,,	15/6

SWEDISH CHARCOAL IRON & STEEL

Pig-iron	£6	0	0	to	£7	0	0
Bars-hammered, basis	£16	0	0	to	£16	10	0
Bars and nail-rods, rolled, basis	£15	15	0	to	£16	0	0
Blooms	£10	0	0	to	£12	0	0
Keg steel	£30	0	0	to	£31	0	0
Faggot steel	£18	0	0	to	£23	0	0
Bars and rods dead soft, st'l	£10	0	0	to	£12	0	0

All per English ton, f.o.b. Gothenburg
[Subject to an exchange basis of Kr. 18.16 to £1.]

DAILY FLUCTUATIONS

Standard Copper (cash)

	£	s.	d.		
Sept. 12 ..	33	13	9	No	change
„ 13 ..	34	2	6	inc.	8/9
„ 16 ..	34	7	6	„	5/-
„ 17 ..	34	12	6	„	5/-
„ 18 ..	34	10	0	dec.	2/6

Electrolytic Copper

	£	s.	d.		
Sept. 12 ..	37	5	0	No	change
„ 13 ..	37	10	0	inc.	5/-
„ 16 ..	38	0	0	„	10/-
„ 17 ..	38	5	0	„	5/-
„ 18 ..	38	5	0	No	change

Standard Tin (cash)

	£	s.	d.		
Sept. 12 ..	221	15	0	inc.	55/-
„ 13 ..	222	0	0	„	5/-
„ 16 ..	225	5	0	„	65/-
„ 17 ..	226	0	0	„	15/-
„ 18 ..	226	17	6	„	17/6

Tin (English ingots)

	£	s.	d.		
Sept. 12 ..	221	15	0	inc.	50/-
„ 13 ..	222	5	0	„	10/-
„ 16 ..	225	10	0	„	65/-
„ 17 ..	226	0	0	„	10/-
„ 18 ..	227	0	0	„	20/-

Spelter (ordinary)

	£	s.	d.		
Sept. 12 ..	15	5	0	inc.	2/6
„ 13 ..	15	5	0	No	change
„ 16 ..	15	5	0	„	„
„ 17 ..	15	5	0	„	„
„ 18 ..	15	10	0	inc.	5/-

Spelter (Electro, 99.9 per cent.)

	£	s.	d.		
Sept. 12 ..	17	17	6	inc.	2/6
„ 13 ..	17	16	3	dec.	1/3
„ 16 ..	17	17	6	inc.	1/3
„ 17 ..	17	17	6	No	change
„ 18 ..	18	2	6	inc.	5/-

Zinc Sheets (English)

	£	s.	d.		
Sept. 12 ..	24	0	0	inc.	10/-
„ 13 ..	24	0	0	No	change
„ 16 ..	24	0	0	„	„
„ 17 ..	24	0	0	„	„
„ 18 ..	24	0	0	„	„

Lead (English)

	£	s.	d.		
Sept. 12 ..	18	0	0	inc.	10/-
„ 13 ..	18	0	0	No	change
„ 16 ..	18	0	0	„	„
„ 17 ..	18	5	0	inc.	5/-
„ 18 ..	18	10	0	„	5/-

A COMPARISON OF SCRAP PRICES

Prices of Heavy Steel Scrap (Delivered) in the Principal Districts at the Beginning of Each Month in the Years 1929–1935.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Scotland—													
1929	3 5 6	3 7 6	3 12 6	3 15 0	3 15 0	3 15 0	3 15 6	3 16 0	3 17 6	3 15 0	3 12 6	3 10 6	3 13 1½
1930	3 9 0	3 7 6	3 5 0	3 5 0	3 0 6	2 15 0	2 12 0	2 10 0	2 13 3	2 10 0	2 10 0	2 10 0	2 17 3½
1931	2 7 6	2 7 6	2 5 0	2 5 0	2 0 0	1 17 6	1 17 6	1 17 6	1 17 6	1 15 0	2 0 0	2 2 6	2 1 0½
1932	2 2 6	2 2 6	2 0 0	1 17 6	1 17 6	1 17 6	1 15 0	1 15 0	1 12 6	1 13 0	1 12 6	1 15 0	1 16 9½
1933	1 15 0	1 17 6	1 18 6	1 18 9	1 18 0	1 17 6	1 18 9	2 0 0	2 2 6	2 5 0	2 7 6	2 8 9	2 0 7½
1934	2 8 9	2 14 3	2 13 0	2 12 0	2 10 0	2 10 0	2 10 6	2 10 6	2 11 0	2 10 9	2 10 0	2 10 0	2 11 2
1935	2 10 0	2 10 0	2 10 0	2 10 0	2 10 0	2 10 0	2 10 0	2 10 0	—	—	—	—	—
North-East Coast—													
1929	3 0 0	3 2 6	3 3 6	3 3 6	3 3 6	3 5 0	3 5 0	3 5 0	3 5 0	3 6 6	3 5 0	3 3 6	3 4 0
1930	3 3 6	3 3 6	3 2 0	3 0 0	2 17 6	2 10 0	2 10 0	2 7 6	2 7 6	2 7 6	2 5 0	2 6 0	2 13 4
1931	2 6 0	2 6 0	2 5 0	2 5 0	2 2 6	2 0 0	1 17 6	1 17 6	1 17 6	1 17 6	1 17 6	2 2 6	2 1 2½
1932	2 0 0	2 0 0	1 15 0	1 15 0	1 15 0	1 15 0	1 15 0	1 15 0	1 15 0	1 12 6	1 15 0	1 17 6	1 15 10
1933	2 0 0	2 0 0	2 5 0	2 0 0	1 15 0	1 17 6	2 2 6	2 2 6	2 3 6	2 5 0	2 7 6	2 7 6	2 2 2
1934	2 10 0	2 16 0	2 10 0	2 7 6	2 7 6	2 10 0	2 9 9	2 10 0	2 10 0	2 10 0	2 11 6	2 11 3	2 10 3½
1935	2 11 6	2 11 9	2 12 0	2 12 0	2 12 6	2 12 6	2 12 6	2 12 6	—	—	—	—	—
South Wales—													
1929	3 8 6	3 10 6	3 15 0	4 0 0	4 0 0	3 18 0	3 17 6	3 17 6	3 15 0	3 15 0	3 12 6	3 7 6	3 14 9
1930	3 7 6	3 6 0	3 6 0	3 4 0	3 2 6	2 17 6	2 16 0	2 15 0	2 14 9	2 12 6	2 12 6	2 5 0	2 18 3½
1931	2 5 0	2 7 6	2 7 6	2 5 0	2 2 6	2 0 0	2 0 0	1 18 0	2 2 6	2 5 0	2 7 6	2 4 0	
1932	2 6 6	2 6 0	2 5 0	2 2 6	2 2 0	1 19 0	1 17 6	1 18 6	1 18 0	1 18 0	1 17 6	1 18 0	2 0 8½
1933	2 0 0	2 1 6	2 4 0	2 3 6	2 3 6	2 3 0	2 5 0	2 5 0	2 8 0	2 10 0	2 10 0	2 10 0	2 5 3½
1934	2 10 0	2 16 3	2 15 9	2 13 9	2 14 3	2 15 0	2 14 3	2 14 3	2 15 0	2 15 6	2 15 6	2 15 6	2 14 7
1935	2 15 6	2 15 6	2 15 6	2 15 6	2 15 6	2 15 6	2 15 6	2 15 6	—	—	—	—	—

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APPOINTMENT wanted in Manchester as Resident Engineer for blast furnaces producing foundry pig-iron and other foundry material.—Address Box 392, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

MANAGER seeks more progressive appointment. General engineering; capable buyer; designer; extensive repetition foundry work; estimating, planning, mass-production light machinery, lawn mowers, and sales experience. Excellent personality. Salary £650.—Box 388, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

MECHANICAL DRAUGHTSMAN (31) with 15 years' experience in design and production of castings (principally non-ferrous) seeks situation with progressive firm as Estimator or Assistant Manager. Knowledge modern costing and accounting systems, etc. Moderate salary.—Box 390, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

CHEMIST wanted for ironfoundry. Experienced in analysis of cast and alloy irons. State age and salary required.—Apply Box 394, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

FOREMAN wanted to take charge of foundry employing about 40 men. Must have latest technical knowledge, references and experience. —Apply DEAN SMITH & GRACE, The Lathe People, Keighley.

MANAGER required for vitreous-enamelling department of old-established firm in North of England. Must have both commercial and technical knowledge. State age, salary expected, and experience.—Box 398, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PRACTICAL and experienced Steelfoundry Foreman required, North-Eastern district. Apply stating age, experience and salary required, and when available, to Box 386, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PRACTICAL Foundryman Demonstrator and and Salesman required to push sale Core Compounds throughout the U.K. Good connection essential. Write fullest details, past experience, salary, etc., in strict confidence.—"E.P.," Box 17771, c/o DAWSON'S, 129, Cannon Street, London, E.C.4.

REFRACTORY and moulding-sand manufacturers require Representative for North-East Coast area. Preferably man now carrying foundry-equipment agencies or similar. Only men with first-class connection with foundries considered. Genuine proposition. First-class ganisters and sands. Easily saleable by live men.—Apply Box 382, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

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AGENCY or Representation for Repetition Castings in grey and malleable iron, wanted in conjunction with present live connection with electrical industry in London area. Office Victoria Street; one other agency held.—Box 372, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

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WANTED, a second-hand Pug Mill for iron-foundry purposes, about 5 ft. dia. State price, maker, and where machine can be inspected to Box 396, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

PATENT Sand-Mixing Machine (Whizzer), double-cage type; ball bearings throughout; cost £120 when new; price £40 or near offers.—NEWBYS, Phœnix Foundry, West Bromwich.

NEW Dwarf Cupola, to melt 10 to 15 cwts. per hr. New Worm-geared Ladles, 5 tons, 25 cwts., 15 cwts. and 10 cwts. capacity. Ungeared Ladles, 15 cwts. and 10 cwts. capacity. Improved Cupola Spark Arresters.—T. DAVIES & SON, West Gorton, Manchester.

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Room Plants, sizes 12 ft. x 12 ft., 12 ft. x 9 ft. and 6 ft. x 6 ft., made up in cast-iron sections.

Barrel Plants, 30 in. dia. x 36 in. long and 30 in. dia. x 18 in. long rotary barrels.

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Several small complete barrel plants in stock.

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FLUIDITY TESTS as described in THE FOUNDRY TRADE JOURNAL, February 1, 1934. Patterns of the above in aluminium can be supplied for 35s. per set. Post free. We can also supply Patterns for all branches of the engineering trade, in hard or soft woods. Send us your inquiries. — FURMSTON & LAWLOR, Patternmakers, Letchworth, Herts.

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